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INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

AD-A227 041

MAXWELL AFB, ALABAMA

PREPARED FOR

UNITED STATES AIR FORCE AFESC/DEV

Tyndall AFB, Florida

and

HQ AIR UNIVERSITY/DEEV

Maxwell AFB, Alabama



JANUARY 1984

NOTICE

This report has been prepared for the United States Air Force by Engineering-Science for the purpose of aiding in the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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PHASE I: RECORDS SEARCH MAXWELL AFB, ALABAMA

Prepared For
United States Air Force
AFESC/DEV
Tyndall AFB, Florida
and
HQ AIR UNIVERSITY/DEEV
Maxwell AFB, Alabama

January 1984

Prepared By

ENGINEERING-SCIENCE 57 Executive Park South, Suite 590 Atlanta, Georgia 30329 #36314

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EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation/Quantification; Phase III, Technology Base Development; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Maxwell AFB under Contract No. F08637-80-G0009-5008.

INSTALLATION DESCRIPTION

Maxwell Air Force Base is located in Montgomery County, Alabama. The City of Montgomery, Alabama borders the base on the east and south. The north portion of the base is situated on the Alabama River in a floodplain area. The study area for this project included the main base comprised of 2,524 acres of which 2,487 acres are owned by the Air Force and 37 acres are leased and several off-base facilities which are under the jurisdiction of Maxwell AFB. These facilities are as follows:

Gunter Air Force Station	•	•	•	•	•		•	•	•	368	acres
Maxwell Family Housing Annex			•	•	•		•	•	•	30	acres
Lake Martin Recreation Area	•	•	•	•	•	•	•	•	•	55	acres
Lake Pippin Recreation Area	_		_	_	_				_	50	acres

Maxwell Air Force base had its beginning in 1910 when Orville Wright came to Montgomery with five student fliers and one mechanic to start a flying school. Wright's venture lasted less than a year and the

area which is now Maxwell AFB had little use until the outbreak of World War I. In 1918, during the height of the first World War, the Army leased some 300 acres and established the Montgomery Air Intermediate Depot primarily to provide engine and aircraft repair and maintenance support for six other airfields in the southeast. The leased acreage for the base was then purchased in 1920. In November 1922, the Montgomery Air Intermediate Depot was renamed "Maxwell Field". Construction of the first permanent buildings on the base was completed in May 1928.

In June 1931, the first troops from the Air Corps Tactical School arrived at Maxwell Field as part of the transfer of that facility from Langley Field, Virginia. Then in 1940, because of events leading to World War II, the facilities were utilized by the Southeast Air Corps Training Center to train officers and pilots. Both the Air Corps Tactical School and the Southeast Air Corps Training Center served as flight training operations rather than maintenance and repair organizations.

In 1946, Air University (AU) was established and Maxwell became the home of the Air Force's center for the professional military education. Presently, Air University provides instruction for more than 500,000 students annually. Active flying on Maxwell is currently limited to a tenant reserve unit.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicate the following major points that are relevant to the evaluation of past hazardous waste management practices at Maxwell AFB:

- o Study area mean annual precipitation is reported to be 52.1 inches and net precipitation was calculated to be approximately eight inches which represents the meteoric water available for infiltration. The 24-hour maximum rainfall event is 6.3 inches.
- o Much of Maxwell AFB is located in the zone flooded by a 100-year event. Gunter AFS is located above the 100-year flood zone.

- o Surface soils at both Maxwell AFB and Gunter AFS tend to be moderately to poorly permeable, but are underlain by highly permeable soils at shallow depths.
- o The terrace deposit aquifer is presently at ground surface at both Maxwell AFB and Gunter AFS. Water levels in this unit are shallow (3.5 to 7 feet below ground).
- o The terrace deposits form the shallow aquifer in the study area and directly overlie and provide recharge to the Eutaw, which is present at shallow depth (40 feet) below ground surface. The Eutaw is a major regional aquifer. No separation exists between the terrace materials and the Eutaw. The water level in the Eutaw was measured at 10 feet below ground surface in a well at Maxwell AFB.
- o Two major regional aquifers, the Gordo and Coker exist below the Eutaw and communicate with it. The city obtains most of its ground-water supplies from these two aquifers.
- o Contaminants including arsenic and lead are entering the base through the surface drainage influent from a portion of the City of Montgomery on the east side of Maxwell AFB.
- o No known endangered or threatened species of plants or animals exist on either Maxwell AFB or Gunter AFS.

From these major points it may be noted that potential pathways for the migration of hazardous waste-related contamination exist. Hazardous materials present at ground surface could be mobilized to the area's shallow aquifer (terrace deposits) and subsequently discharged to local surface streams or transferred to the underlying Eutaw or Gordo Formations as recharge.

METHODOLOGY

During the course of this project, interviews were conducted with base personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and Federal agencies; and field and helicopter reconnaissance inspections were conducted at past hazardous waste activity sites. Eleven sites were identified as

containing potentially hazardous contaminants resulting from past activities (Figure 1). These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on action.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team's field inspection, review of base records and files and interviews with base personnel.

The areas determined to have a sufficient potential to create environmental contamination are as follows:

Electroplating Waste Disposal Site

Surface Drainage System

Landfill No. 4

C. E. Drum Storage Area

Fire Protection Training Area No. 2

Landfill No. 5

Landfill No. 6

Fire Protection Training Area No. 1

Landfill No. 2

Landfill No. 3

Follow-on investigations for these areas is warranted.

The area determined to have an insufficient potential to create environmental contamination is as follows:

Hardfill Area No. 2

Follow-on investigation for this area is not warranted.

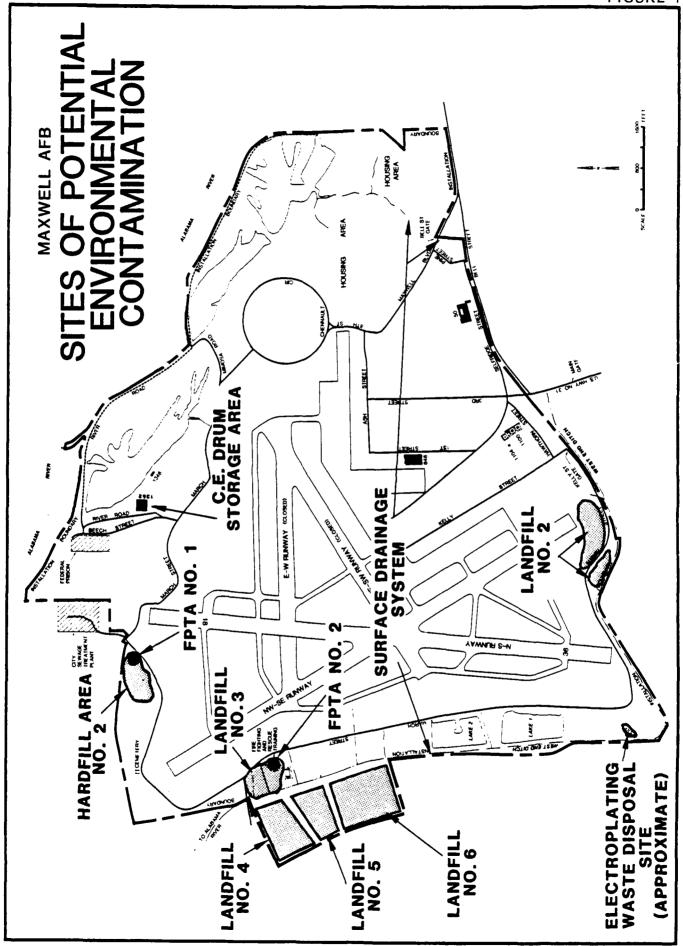


TABLE 1 SITES ASSESSED USING THE HAZARD ASSESSMENT RATING METHODOLOGY

MAXWELL AFB

Rank	Site Name and Number	Time Period	Final Score
1	Electroplating Waste Disposal Site	Late 1940's to Mid 1960's	72
2	Surface Drainage System	1940's to Early 1970's	72
3	Fire Protection Training Area No. 2	1962 to Present	59
4	Fire Protection Training Area No. 1	1940's to 1962	58
5	Landfill No. 4	1956 to Early 1970's	54
6	C. E. Drum Storage Area	Mid-1970's to Present	53
7	Landfill No. 5	Early 1970's to 1974	52
8	Landfill No. 6	1974 to Present	52
9	Landfill No. 2	Early 1940's to 1951	51
10	Landfill No. 3	1951-1956	51
11	Hardfill Area No. 2	1951-Present	44

RECOMMENDATIONS

Recommended guidelines for future land use restrictions at the disposal sites identified are presented in Chapter 6. The detailed recommendations developed for further assessment of areas of environmental concern at Maxwell AFB are also presented in Chapter 6. These recommendations are summarized as follows:

o Electroplating Waste Disposal Site Conduct an electromagnetic and/or magnetometer survey to confirm the locations of buried drums. Install three monitoring wells and implement ground-water monitoring program.

o Surface Drainage System

Collect and analyze thirteen stream sediment samples. Expand the number of surface water sampling points by four in West End Ditch. Implement expanded list of parameters for existing surface monitoring points on Maxwell AFB.

o Fire Protection Training Area No. 2 and Landfill No. 3 Conduct a geophysical survey to delineate the extent of the site. Install three monitoring wells and implement ground-water monitoring program.

o Fire Protection Training Area No. 1

Install three monitoring wells and implement ground-water monitoring program.

o Landfill No. 4, No. 5 and No. 6

Conduct a geophysical survey to delineate the extent of the site. Install four monitoring wells and implement ground-water monitoring program.

o C. E. Drum Storage Area

Install three monitoring wells and implement ground-water monitoring program.

o Landfill No. 2

Conduct a geophysical survey to delineate the extent of the site. Install three monitoring wells and implement ground-water monitoring program.

SECTION 1 INTRODUCTION

BACKGROUND AND AUTHORITY

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of past disposal sites and take action to eliminate hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 3012 and 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and state agencies to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and clarified by Executive Order 12316. CERCLA is the primary legislation governing remedial action at past hazardous waste disposal sites.

PURPOSE AND SCOPE

The Installation Restoration Program has been developed as a fourphased program as follows:

Phase I - Initial Assessment/Records Search

Phase II - Confirmation/Quantification

Phase III - Technology Base Development

Phase IV - Operations/Remedial Actions

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Maxwell Air Force Base (AFB) under Contract No. F08637-80-G0009-5008. This report contains a summary and an evaluation of the information collected during Phase I of the IRP and recommendations for follow-on actions. The land areas included as part of the Maxwell AFB study are as follows:

Main Base Site	2,524	acres
Gunter Air Force Station	368	acres
Maxwell Family Housing Annex	30	acres
Lake Martin Recreational Area	55	acres
Lake Pippin Recreational Area	50	acres

The objective of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Maxwell AFB, and to assess the potential for contaminant migration. The activities that were performed in the Phase I study included the following:

- Review site records
- Interview personnel familiar with past generation and disposal activities
- Inventory generation of wastes in the past
- Estimate quantities and locations of current and past hazardous waste treatment, storage, and disposal
- Definition of the environmental setting at the base
- Review past disposal practices and methods

- Field and aerial reconnaissance
- Gathering pertinent information from Federal, state and local agencies
- Assessment of potential for contaminant migration.
- Develop recommendations for follow-on actions.

ES performed the on-site portion of the records search during August 1983. The following team of professionals were involved:

- R. M. Reynolds, Chemical Engineer and Project Manager, BChE, 10 years of professional experience
- J. R. Absalon, Hydrogeologist, BS Geology, 10 years of professional experience
- R. L. Thoem, Environmental Engineer, MS Sanitary Engineering, 20 years of professional experience

More detailed information on these individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Maxwell AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with 41 past and present base employees from the various operating areas. Those interviewed included current and past personnel associated with the Civil Engineering Squadron, Bioenvironmental Engineering Services, Reserve Units, and Fuels Management Branch. A listing of interviewee positions with approximate years of service is presented in Appendix B.

Concurrent with the base interviews, the applicable Federal, state and local agencies were contacted for pertinent base related environmental data. The agencies contacted and interviewed are listed below as well as in Appendix B.

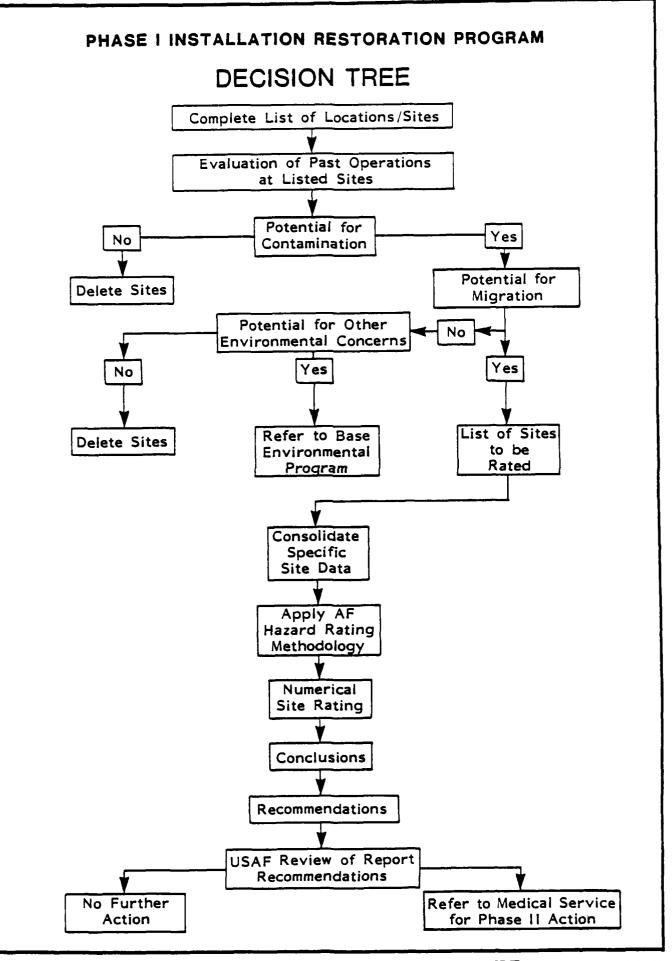
- o U.S. Geological Survey (USGS), Water Resources Division
- o Alabama Department of Environmental Management

- o U.S. Department of Agriculture, Soil Conservation Service
- o Montgomery Municipal Water Works, City Water Supply Division
- o Mobile District, U.S. Army Corps of Engineers
- o U.S. Environmental Protection Agency, Region IV
- o Geological Survey of Alabama

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour and a helicopter overflight of the identified sites were then made by the ES Project Team to gather site-specific information including: (1) visual evidence of environmental stress; (2) the presence of nearby drainage ditches or surface water bodies; and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the decision tree shown in Figure 1.1. If no potential existed, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there were no further environmental concerns, then the site was deleted. If there are other environmental concerns then these are referred to the base environmental program. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix G. The sites that were evaluated using the HARM procedures were also reviewed with regard to future land use restrictions.



SECTION 2 INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

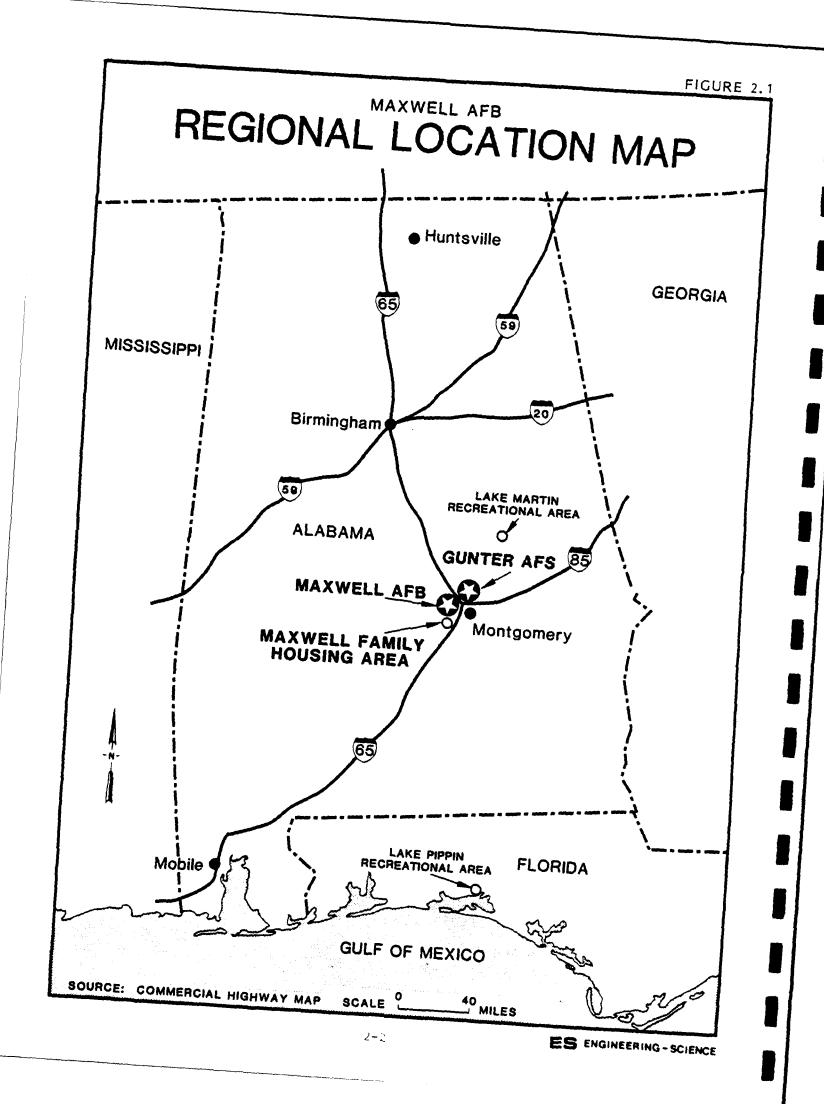
Maxwell AFB is located in Montgomery County, Alabama. The City of Montgomery, Alabama borders the eastern and southern portion of Maxwell AFB with the Alabama River bounding the base on the north (Figure 2.1 and 2.2). To the south and west of Maxwell AFB, the land uses are mixed residential and industrial. A public housing project and the central business district of Montgomery are located east of the base. An extensive undeveloped floodplain is located north of the base along the river. Figure 2.3 depicts the configuration of the 2,524 acres comprising Maxwell AFB of which 37 acres is leased land. Several other facilities are under the jurisdiction of Maxwell AFB. These facilities are described below and are shown in Figure 2.4.

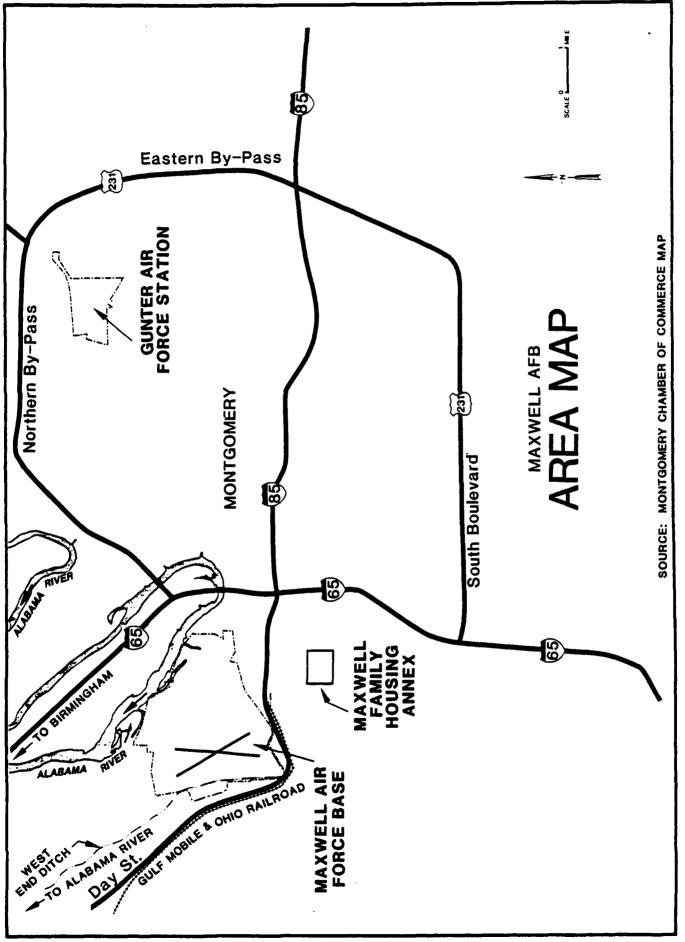
Gunter Air Force Station (AFS): 368 acres (349 acres are owned by the Air Force and 19 acres are leased) located five miles from Maxwell AFB on the east side of Montgomery. The leased area is a narrow strip of land located on the east corner of the facility and includes Building 900. Gunter AFS hosts the Air Force Senior NCO Academy and the Air Force Data System Design Center.

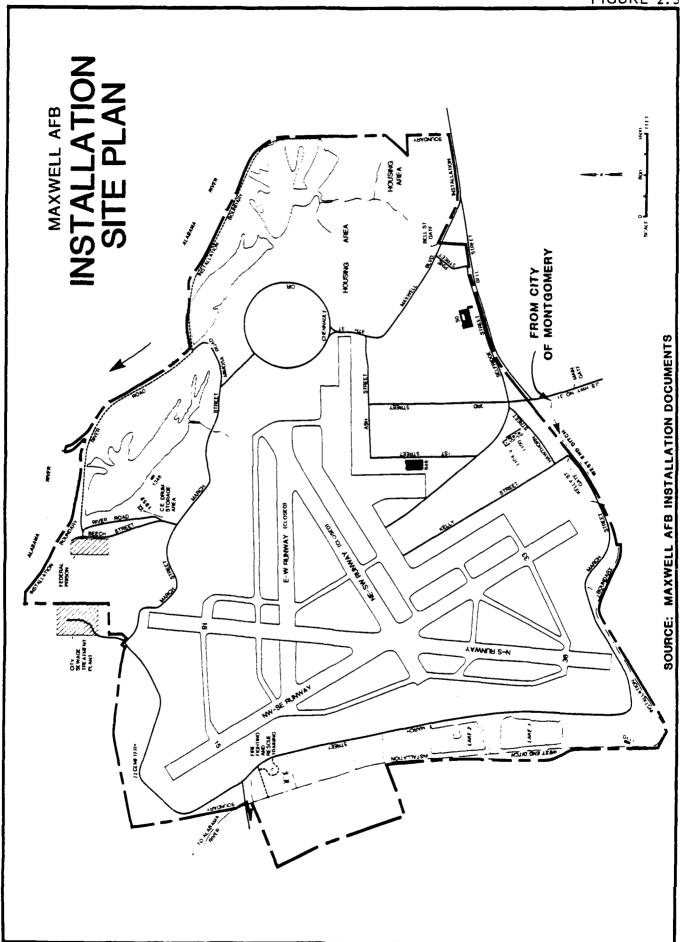
Maxwell Family Housing Annex: 30 acres located one mile south of Maxwell AFB.

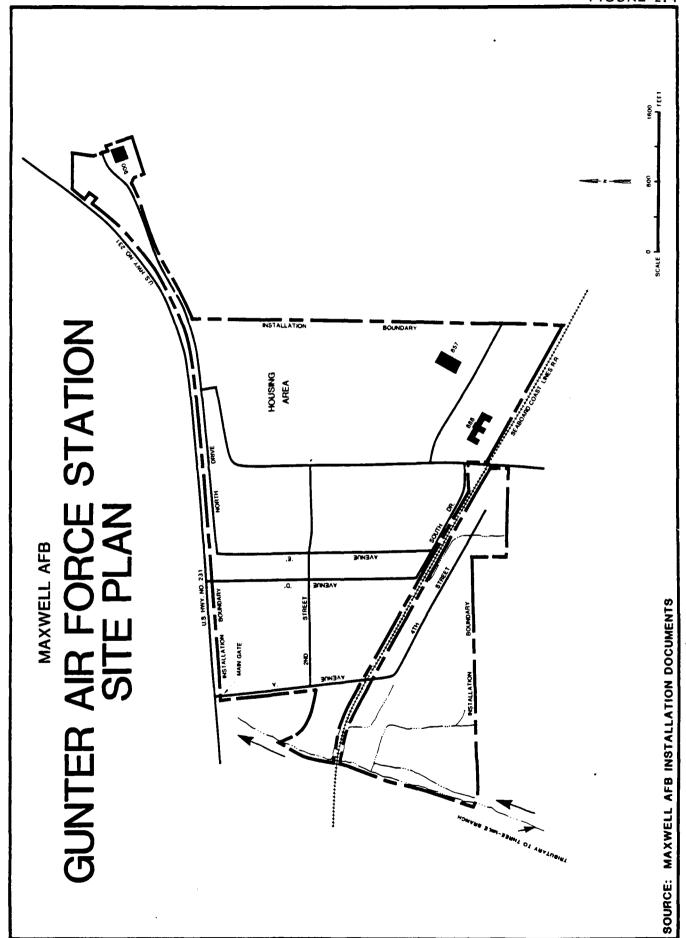
Lake Martin Recreational Area: 55 acres located 65 miles northeast of Maxwell AFB near Dadeville, Alabama.

Lake Pippin Recreational Area: 50 acres located 165 miles south of Maxwell AFB on Eglin AFB reservation. Lake Pippin area is leased to Maxwell AFB by Eglin AFB.









Lake Pippin and Lake Martin recreational areas and the Maxwell Family Housing Annex have had no hazardous waste disposal activities and are not considered further in this study.

BASE HISTORY

Maxwell AFB

Maxwell Air Force Base had its beginning in 1910 when Orville Wright came to Montgomery with five student fliers and one mechanic to start a flying school. Wright's venture lasted less than a year and the area which is now Maxwell AFB had little use until the outbreak of World War I. In 1918, during the height of the first World War, the Army leased some 300 acres and established the Montgomery Air Intermediate Depot primarily to provide engine and aircraft repair and maintenance support for six other airfields in the southeast. The leased acreage for the base was then purchased in 1920. In November 1922, the Montgomery Air Intermediate Depot was renamed "Maxwell Field". Construction of the first permanent buildings on the base was completed in May 1928.

In June 1931, the first troops from the Air Corps Tactical School arrived at Maxwell Field as part of the transfer of that facility from Langley Field, Virginia. Then in 1940, because of events leading to World War II, the facilities were utilized by the Southeast Air Corps Training Center to train officers and pilots. Both the Air Corps Tactical School and the Southeast Air Corps Training Center served as flight training operations rather than maintenance and repair organizations.

In 1946, Air University (AU) was established and Maxwell became the home of the Air Force's center for the professional military education. Presently, Air University provides instruction for more than 500,000 students annually. Active flying on Maxwell is currently limited to a tenant reserve unit.

Gunter AFS

Activated on August 27, 1940, as a basic flying school, American, British, French and Chinese pilots were trained at Gunter AFS during World War II. In 1946, training of U. S. Armed Forces students received major emphasis at Gunter AFS.

In the past there have been several tenants occupying the installation. In the 1950s, the Medical Service School was housed at Gunter AFS. In 1957, the Montgomery Air Defense Sector was activated at Gunter AFS and then during the 1960s, the headquarters for the 14 Air Force, was located at the base, along with the 32 Air Division. These organizations provided mainly administrative support and have since been relocated or deactivated and no active flying is presently conducted at Gunter AFS.

In July, 1971, the Air Force Data Systems Design Center (AFDSDC) was transferred to Gunter AFS. AFDSDC is responsible for designing standard automated data systems assigned by Headquarters USAF. In June 1978, the AFDSDC became a direct reporting unit of the Air Force Communication Command.

During the 1940's, the size of Gunter AFS grew to about 1,200 acres most of which was leased from the City of Montgomery. In 1946, all aircraft stationed at Gunter AFS were transferred to Maxwell AFB and in 1949 all flying at Gunter AFS stopped. In 1971, approximately 800 acres of leased land on Gunter AFS was returned to the City of Montgomery. The remaining property is owned by the Department of Defense.

PRIMARY ORGANIZATION AND MISSION

The primary mission of Maxwell AFB is to support the Air University. The 3800 Air Base Wing and the 3800 Air Base Squadron operate and maintain Maxwell AFB and Gunter AFS, respectively, and provide logistic support and base services for Air University organizations located on these installations. The components of the Air University assigned to Maxwell AFB and Gunter AFS are listed below. Descriptions of these organizations and their individual missions are presented in Appendix C. Maxwell AFB

Headquarters, Air University
Air War College
Squadron Officer School
Air Command and Staff College
Education and Development Center
Leadership and Management Development Center
Air University Library

Maxwell AFB (continued)

USAF Regional Hospital - Maxwell

Headquarters, Civil Air Patrol

Air University Manpower and Organization Directorate

Center for Aerospace Doctrine, Research and Education

Gunter AFS

AF Senior NCO Academy

AF Logistics Management Center

Extension Course Institute

Air University Field Printing Plant

TENANT ORGANIZATIONS AND MISSIONS

Maxwell AFB and Gunter AFS also host several tenant organizations. The tenant organizations are listed below and descriptions of their missions are also presented in Appendix C.

Maxwell AFB

Headquarters, Air Force ROTC

USAF Auditor General Representative Office

USAF Trial Judiciary

Federal Prison

908 Tactical Airlift Group (Reserves)

1973 Communications Squadron

Det. 9, 24 Weather Squadron

Det. 3, 1402 Military Airlift Squadron

District 8, OSI (IG), HQ USAF

Corps of Engineers

USAF Postal and Courier Flights

Air Force Medical Management Team

Albert F. Simpson Historical Research Center

Community College of the Air Force

Defense Investigative Service

Federal Aviation Administration

United States Post Office

Gunter AFS

AF Data Systems Design Center

AF Data Systems Evaluation Center

Gunter AFS (continued)

AF Automated Systems Project Office
Defense Property Disposal Office
3531 Recruiting Squadron

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting of Maxwell Air Force Base is described in this section with the primary emphasis directed toward identifying features which may facilitate the movement of hazardous waste contamination off base. A summary of key environmental conditions pertinent to the study is presented at the conclusion of this section.

METEOROLOGY

Temperature, precipitation and snowfall data furnished by Detachment 9, 24 Weather Squadron, Maxwell Air Force Base are presented in Table 3.1. The summarized data indicate that the mean annual precipitation (all forms) is 52.1 inches and the maximum 24-hour rainfall event is 6.3 inches. This corresponds with the value obtained from the National Oceanic and Atmospheric Administration Climatic Atlas of the United States (NOAA, 1977). The NOAA has determined that the mean annual Class A pan evaporation for the study area is 58 inches with a 76 percent coefficient of evaporation. These values result in a calculated net precipitation of approximately eight inches which represents the amount of meteoric water available for infiltration.

GEOGRAPHY

Maxwell Air Force Base is located within the Fall Line Hills subdivision of the Gulf Coastal Plain Physiographic Province. This physiographic division occurs as a narrow band of hilly uplands that have formed along the inner margin of the coastal plain, just south of the Fall Line (the Fall Line is the arbitrary boundary separating the Piedmont from the coastal plain). It is characterized by frequent rolling hills, extensive surficial dissection, nearly level plains and mature streams. Figure 3.1 depicts major study area physio-geographic features.

MAXWELL AFB CLIMATIC CONDITIONS TABLE 3.1

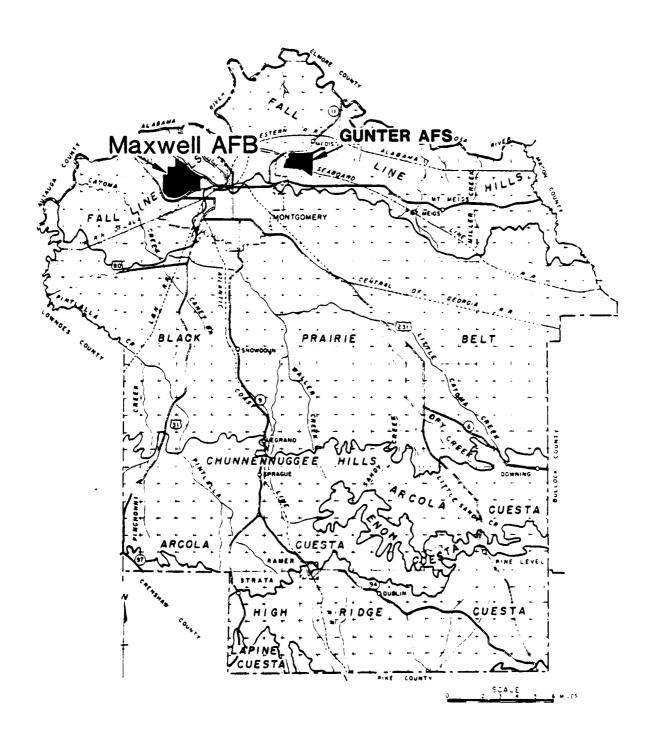
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	Annual	76	99	99	105	70	52.1	19.3	#	6.3	#	9	3

#: Trace

Source: Detachment 9, 24 Weather Squadron, Maxwell AFB. (1983) Period of Record: 1937-1981

MAXWELL AFB

PHYSIOGRAPHIC DIVISIONS OF MONTGOMERY COUNTY, ALABAMA



SOURCE: POWELL, et al., 1957

Topography

The topography of the main sections of Maxwell Air Force Base and Gunter Air Force Station is generally level. Maxwell AFB elevations average 168 feet, National Geodetic Vertical Datum of 1929 (NGVD) and Gunter AFS elevations average 215 feet, NGVD. The only major variation is created by the alluvial terraces of the Alabama River which form the northwest boundary of Maxwell AFB. At Maxwell AFB, maximum local relief is approximately thirty-five feet along the banks of the Alabama River. At Gunter AFS, maximum relief is about five feet along the small stream channel which drains the western section of the installation.

Drainage

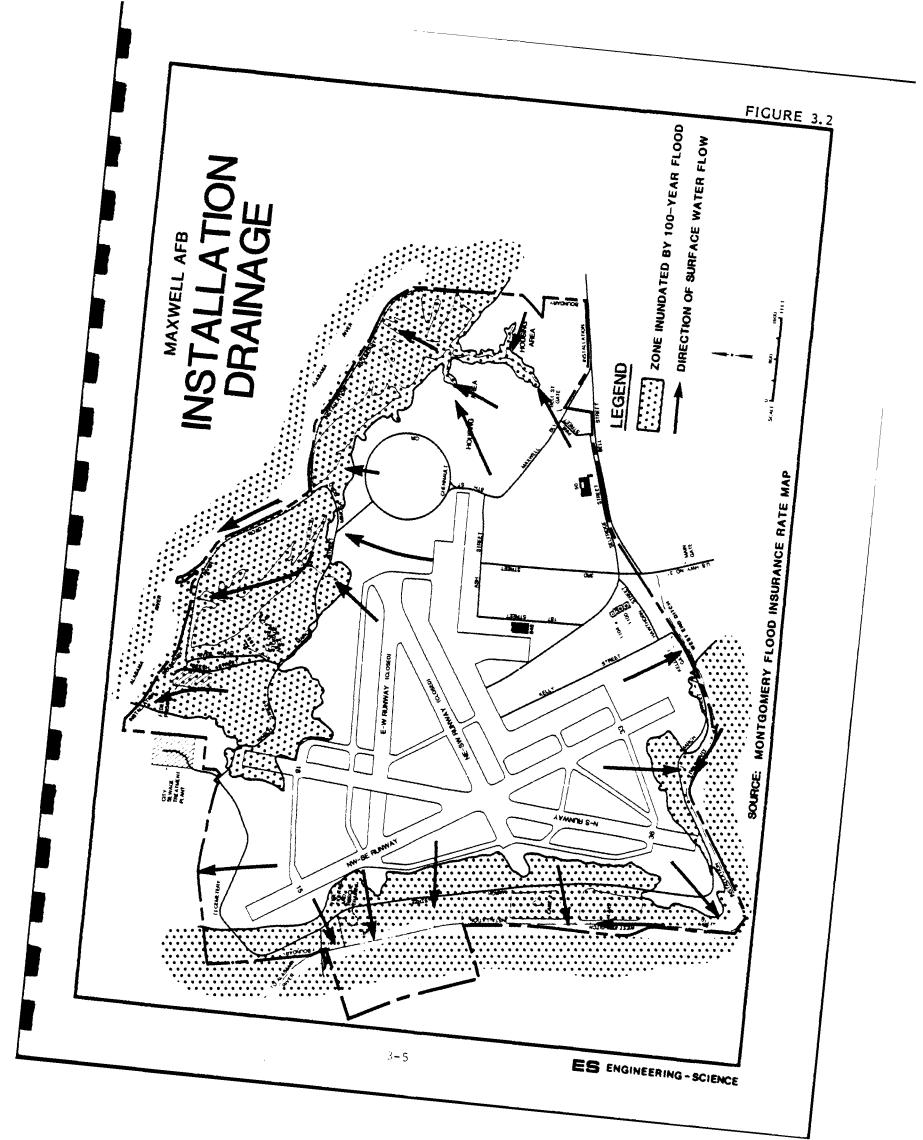
The drainage of Maxwell AFB and Gunter AFS land areas are accomplished by overland flow to diversion structures and then to area streams, all of which terminate in the Alabama River. At Maxwell AFB, the western section of the base drains to West End Ditch, which flows around the southwest installation boundary and joins the Alabama River about two miles northwest of the base. The north, east and south sections of Maxwell drain to local streams and ponds which have outlets to the Alabama River.

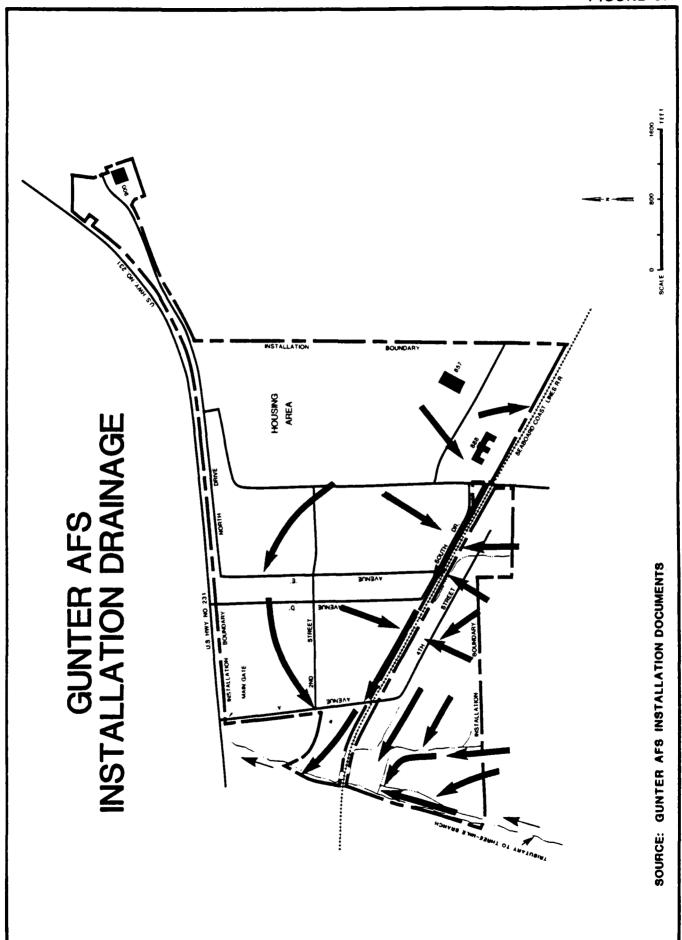
Flooding is known to be a serious problem at Maxwell Air Force Base and may occur on the north, west and south portions of the base. The 100-year flood limits portrayed on Figure 3.2, Maxwell AFB Installation Drainage, are based on the City of Montgomery Flood Insurance Rate Map, published by the Federal Emergency Management Agency, 1974, and roughly correspond to the record flood limits (1962) depicted on installation documents.

Gunter Air Force Station drains westward to Galbraith Mill Creek, which terminates at its confluence with the Alabama River, approximately five miles northwest of the station (Willmon, 1972). Gunter AFS is not known to experience flooding problems, although locally, some wetness could occur briefly due to runoff restriction during sustained precipitation. Figure 3.3 depicts Gunter AFS surface drainage features.

Surface Soils

Surface soils of Montgomery County, Alabama have been identified in a report issued by the U.S. Department of Agriculture, Soil Conservation



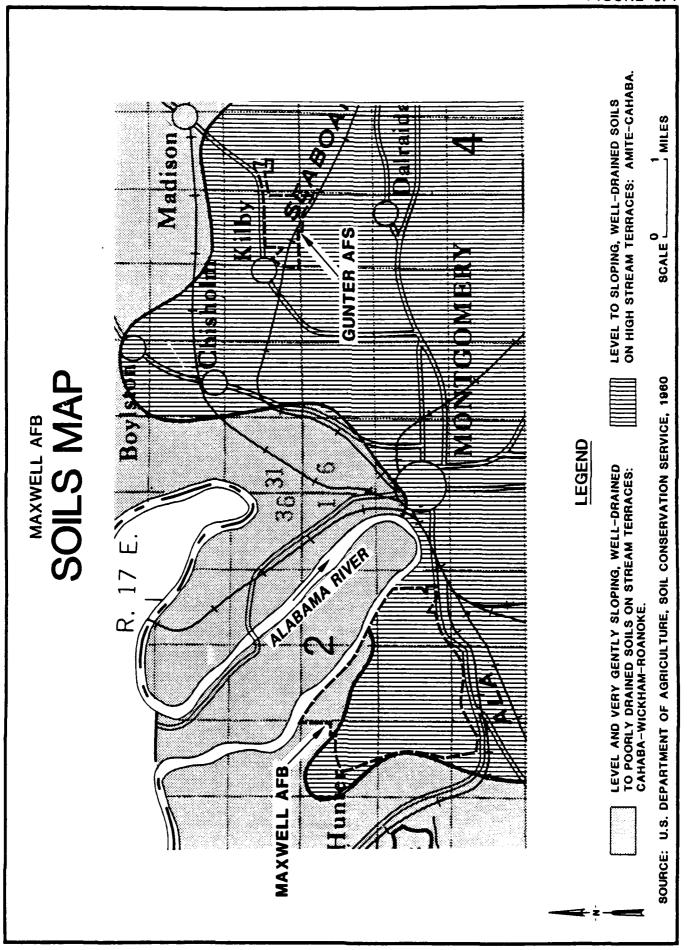


Service (1960). Although a detailed survey was not performed within Maxwell Air Force Base boundaries, a generalized soil association map of the study area was published and is presented as Figure 3.4. A soil association is defined by the Soil Conservation Service as a group of individual soils that collectively form a landscape possessing a distinctive proportional pattern of soils. Two soils associations have been mapped in the study area and are described as follows:

- o Cahaba-Wickham-Roanoke Association (unit 2 on Figure 3.2). This unit occurs along the north and west boundaries of Maxwell AFB. The major soils types are sandy loams and silt loams. The soils of this association usually form level to gently sloping low-lands on floodplains and low stream terraces. They are well to poorly drained. Parts of the association include flat, broad, well-drained areas cut by poorly drained sloughs. Much of the association is underlain by thick gravel beds and possesses a high seasonal water table.
- o Amite-Cahaba Association (unit 4 on Figure 3.2). This unit underlies most of Maxwell AFB and all of Gunter AFS. The soils of this association form level to sloping uplands on high stream terraces. The Amite-Cahaba Association is composed principally of sandy loam, sandy clay loam and sandy clay. Most of the unit is well drained, except those soils occurring along drainage paths, which are poorly drained. Most of the association is underlain by a fine-grained, moderate to poorly permeable subsoil and has a seasonally high water table of ten or more feet below ground surface.

GEOLOGY

Information describing the geologic setting of the Montgomery area has been obtained from Adams, et al. (1926); Carlston (1944); Knowles, et al. (1960 and 1963); Powell et al. (1957) and Moser (1981). Additional information has been obtained from an interview with a U.S. Geological Survey-Water Resources Division (USGS-WRD) hydrologist. A brief review of their work and pertinent comments follow.



Stratigraphy and Structure

Geologic units ranging in age from Upper Cretaceous to recent have been identified in the Coastal Plain deposits of Montgomery County. These units are typically unconsolidated materials consisting of gravel, sand, silt, clay, chalk, glauconite and lignite, reposing on a Precambrian crystalline basement complex.

The Coastal Plain sediments form a southerly dipping wedge, with a point of origin at the Fall Line. The Fall Line, which extends along most of the Atlantic coast is an arbitrary demarcation separating the Piedmont uplands from the Coastal Plain. In Alabama, it extends through Elmore County, north of Montgomery. At the Fall Line, sediment thickness is no more than a few feet, however at the Gulf of Mexico these same strata attain a thickness measured in the thousands of feet. thickness of all unconsolidated deposits at Maxwell AFB is 1,008 feet, as measured in USGS test well G-33, located one thousand feet west of the installation near U.S. Route 31 (Powell, et al., 1957). Well G-33 was identified as "K-24" by Knowles, et al. (1960 and 1963). Individual geologic units within the Coastal Plain sediments tend to dip seaward at a shallow rate and thickens substantially. They are not known to be faulted or otherwise disrupted in the Montgomery area; however past cycles of erosion/deposition may have created significant local variations in unit characters or lithology. Table 3.2 summarizes the geologic units identified in Montgomery County.

Distribution

The surficial geology of Maxwell Air Force Base is dominated by Quaternary Terrace deposits which occur at ground surface and are approximately forty feet thick at USGS test well K-24 (G-33) (Knowles, et al., 1963). The terrace materials consist principally of sands, silts and clays in their upper extent and coarsen with depth (i.e., coarse sands and gravel are prevalent). The terrace deposits at Maxwell AFB were examined in detail by Moser (1981), who reported the lithology as medium to coarse grained, poorly sorted sand, sandy clay and clay (upper extent of the formation).

Several Maxwell AFB test boring locations and all well locations are shown on Figure 3.5. A cross section based upon the test borings is

TABLE 3.2

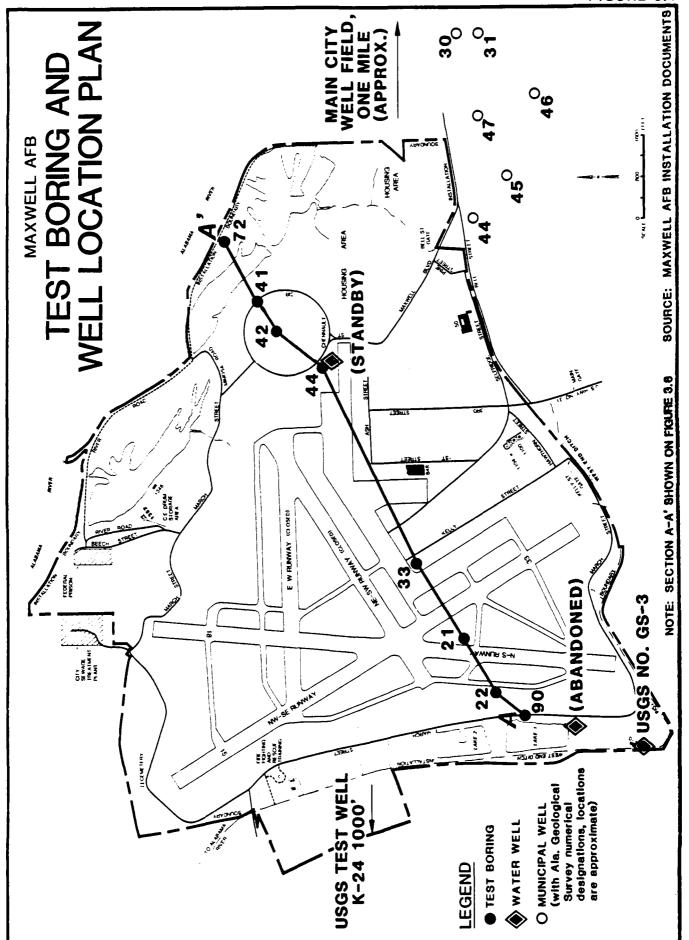
GENERALIZED SECTION OF THE GEOLOGIC FORMATIONS IN MONTGOMERY COUNTY

System	Series	Ė	Stratigraphic C	init	Thickness	Lithology
Quaternary	Recent	Alluvium			3-40 <u>+</u>	Sand, white to light-gray, silty, poorly sorted, lensing; some yellow-ish-orange to bluish-gray sandy clay.
	Pleistocene	Terrace Deposits			10-100+	Sand, pale-yellowish orange, cross- bedded, medium to very coarse grained poorly sorted, ferruginous, quartzitic; dark-reddish-brown sandy clay; and lenses of well rounded gravel ranging in diameter from 4 to 256 mm.
Tertiary	Palaocene	Midway Group	Clayton For	mation		Chalk, gray, sandy; grayisn-white fossiliferous limestone; and gray sandy clay. Present only as outlier on high hill on Montgomery-Crenshaw County boundary.
Crecaceous	Upper Cretaceous	Selma Group	Providence Sand	Upper Member	85	Sand, pale-yellowish-orange, cross- bedded, fine- to coarse grained, poorly sorted; interbedded with white pale-red-purple, and moderate-reddish-brown massive clay. Present as outliners capping high hills in southern Montgomery County.
				Perota Mamber	60	Sand, dark-gray to yellowish-orange very fine to fine-grained, micaceous, carbonaceous, ferruginous, calcareous-cemented, fossiliferous, thinly laminated with clayey silt; some thin beds of hard limonitic sandstone.
			Prairie Blu	ff Chalk	50-90	Chalk, light-olive-gray to yellowish-gray, massive, silty to finely sandy, micaceous, glauconitic, fossiliferous: becomes increasingly sandy toward top. Thins eastward and merges with Providence sand in Bulloc County.
			Ripley Formation	Upper Member	180-315	Sand, greenish-gray to yellowish-gray cross-laminated, fine- to very cross-laminated, fine- to very coarse-grained, poorly to well sorted micaceous, ferruginous, limonitic, glaucontic, calcareous, fossiliferous greenish-gray to pale-olive silty to sandy fissile micaceous, calcareous fossiliferous clay; and thin beds of hard-gray to yellowish-gray fine- to medium-grained argillaceous micaceous ferruginous glauconitic calcareous-cemented fossiliferous sandstone.
				Cusseta Sand Member	3-120	Sand, light-gray to pale-yellowish- orange, fine- to medium-grained, micaceous, glauconitic, fossiliferous light-gray to white taleareous-cemented fossiliferous sandstone; and greenish-gray to white sandy chalk. Thins westward and merges into upper part of Demopolis chalk in central Montgomery Jounty.

TABLE 3.2 (Continued)
GENERALIZED SECTION OF THE GEOLOGIC FORMATIONS IN MONTGOMERY COUNTY

System	Series	3t	ratigraphic U	nit	Thickness	Lithology
Oretaceous cont'd)	Upper Gretaceous (contid)	Seima Group (cont'd)	Demopolis Chalk		250-420	Upper and lower parts are chalk, light- greenish-gray to yellowish-gray, silty to finely sandy, clayey, micaceous, fossiliferous, separated by a bed of relatively pure fossiliferous; separa- ted by a bed of relatively pure, fos- siliferous chalk; contains bentoning clay in southwestern part of county.
			Mooreville Chalk	Arcola Limestone Member	5-10	Limestone, impure, light-gray, thin- bedded, hard, dense, fossiliferous: two to four beds, 6 inches to 1 foot thick, separated by a bed of gray to pale-olive calcareous clay 3 to 6 feet thick.
				Lower Member	600	Chalk, light-greenish-gray to yellow- ish-gray, silty to finely sandy, argillaceous, ferruginous, fossil- iferous: in eastern part of county grades laterally into gray to yellowish-orange sandy calcareous clay
		Eutaw Formation			3-400	Sand, light-greenish-gray, cross- laminated, fine to medium-grained, well-sorted, micaceous, glauconitic, fossiliferous, interbedded with greenish-gray micaceous glauconitic fossiliferous clay and sandy clay. Upper part contains several hard beds, 6 inches to 1 foot thick, of light-gra to white fossiliferous medium-grained quartzitic glauconitic calcareous cemented sandstone.
: :		Tuscaloosa Group	Gordo Formation		195-340	Sand, pale-yellowish-orange, medium to coarse grained, poorly sorted, quartzitic, ferruginous-cemented; interbedded with moderate-reddish brow to pale-red-purple clay. Generally contains a thin bed of gravel at the base and elsewhere in the formation.
			Coker Formation		360-600+	Sand in upper 300 to 400 feet, light greenish-gray, medium to coarsegrained, well-sorted, micaceous, quartizatic, glauconitic, fossilferous; thinly laminated with greenish-gray lightic fossiliferous clay. Lower '5 to 200 feet is chiefly pale-yellowish-orange medium to coarse-grained arkosic sand interbedded with reddishbrown, pale-red-purple, and pale-green sandy clay. Contains thin beds of har calcareous sandstone throughout.
Pre-Cretaced	us Crystallin	e Rocks	·		Unknown	Biotite mica schist.

Source: Knowles, et al., 1963.



presented as Figure 3.6. This section depicts the highly variable nature of terrace deposits as they occur across the upper extent of Maxwell Air Force Base. Similar geologic conditions exist at Gunter Air Force Station. Alluvial materials, chiefly poorly graded fine sands and silts, characterize the surficial geology of lowland areas, floodplains and stream channels. These are recently deposited materials, associated with the development of area streams. Carlston (1944) reported the alluvium to be up to 90 feet thick in the Alabama River Valley.

Several Gunter AFS test boring locations and all well locations are shown on Figure 3.7. Figure 3.8 is a cross section that depicts the nature of terrace deposits as they are encountered at Gunter Air Force Station. The terrace materials are principally poorly graded sands which are occasionally underlain by gravels or gravel-bearing sands. Test boring water levels ranged from 12 to 20 feet below ground.

HYDROLOGY

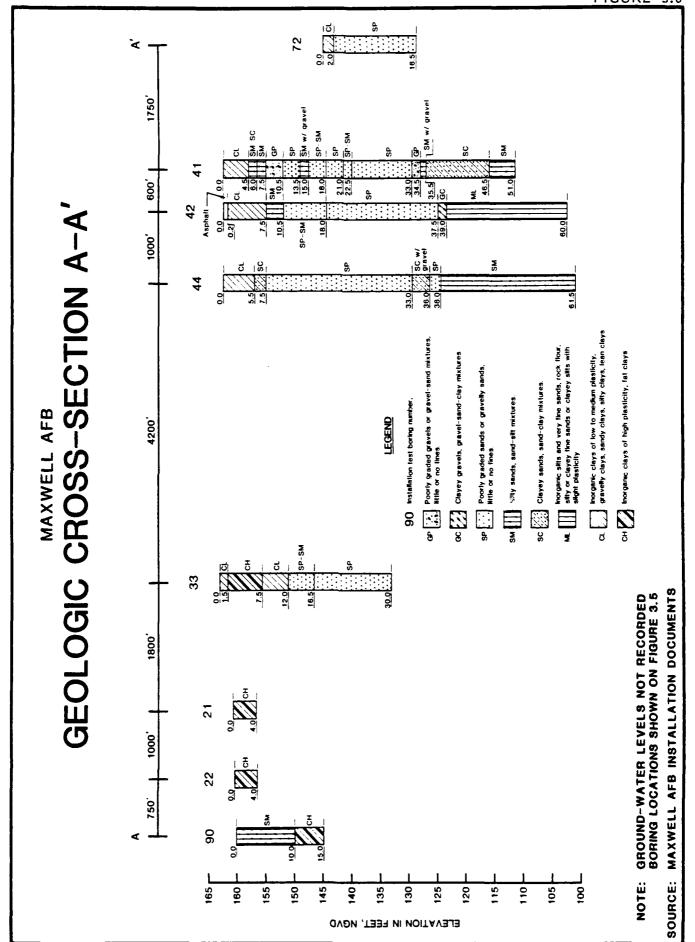
Ground-water hydrology of the project area has been reported by Carlston (1944); Carter (1949); Powell, et al., (1957); Knowles, et al., (1960 and 1963) and Moser, (1981). Additional information has been obtained from an interview with a U.S. Geological Survey - Water Resources Division hydrologist.

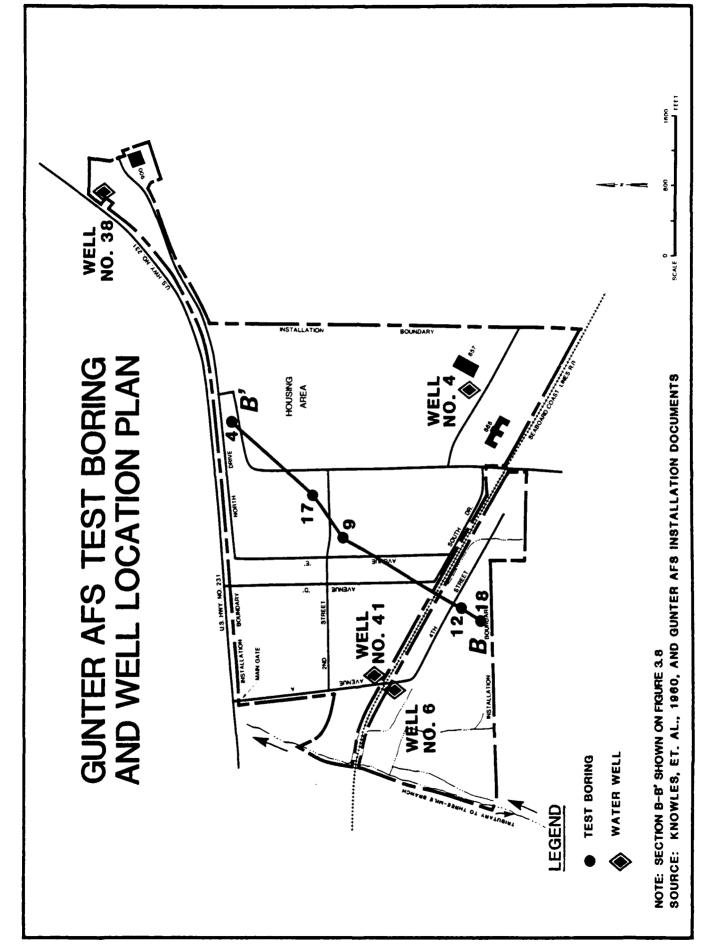
Hydrogeologic Units

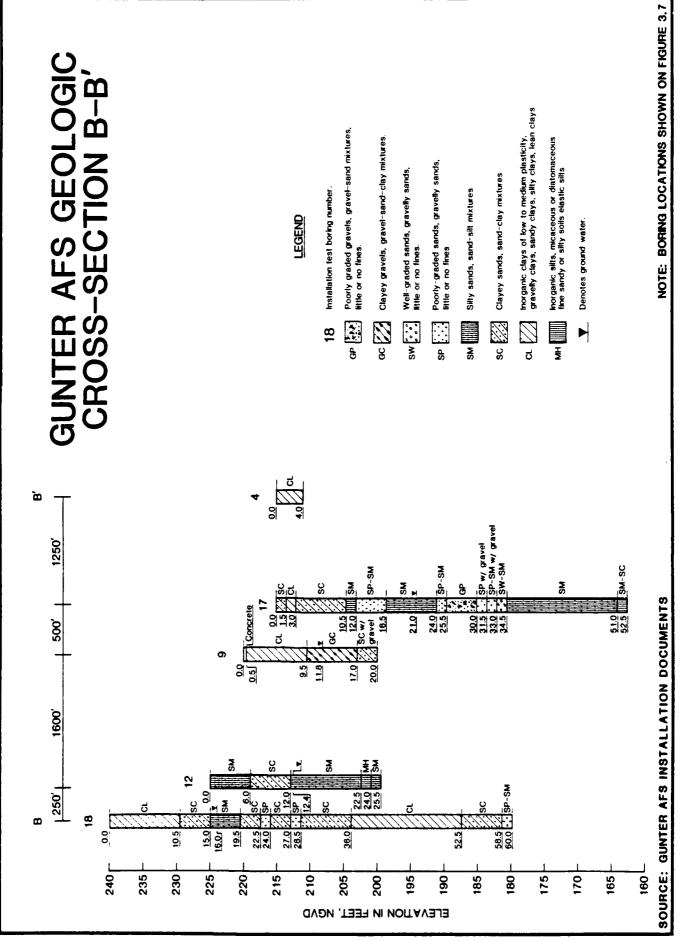
Maxwell Air Force Base and Gunter Air Force Station both lie within the uplands section of the Gulf Coastal Plain. In this area several major hydrogeologic units have been identified, which are listed on Table 3.2. The units of particular interest to this investigation include the following:

- o Recent Alluvium
- o Pleistocene Terrace Deposits
- o Eutaw Formation
- o Gordo Formation
- o Coker Formation

These units are summarized in the following overview which has been divided according to the typical depths (shallow or deep) at which they







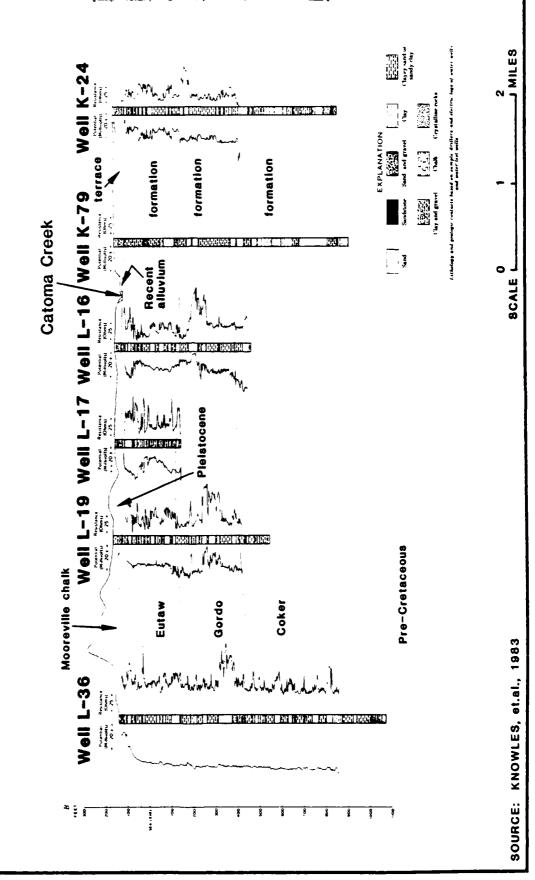
may be encountered. They may be seen in stratigraphic sequence on Figure 3.9, a hydrogeologic cross section drawn through the project area.

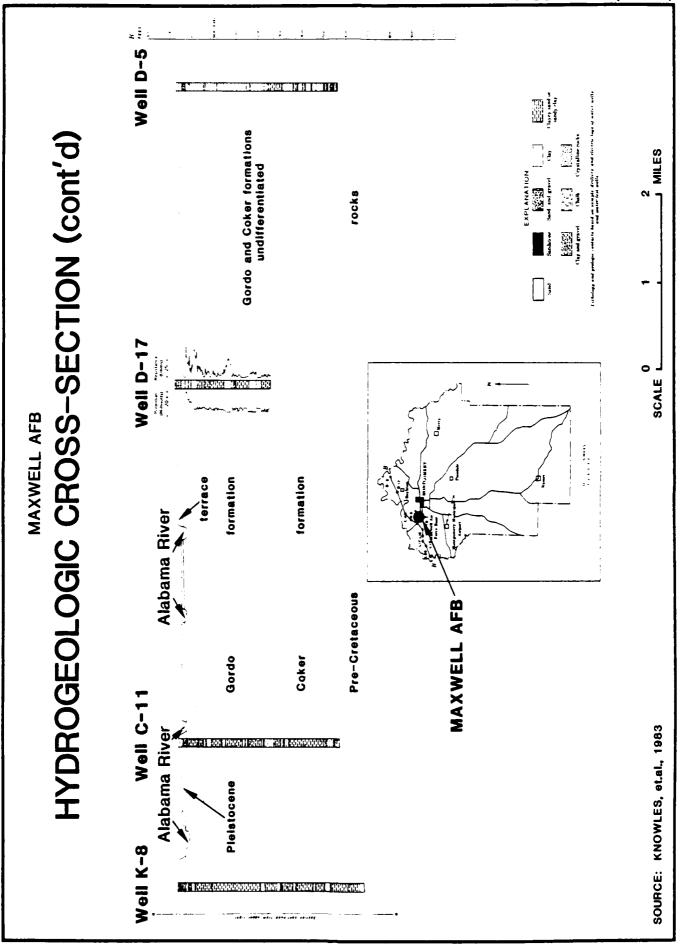
Shallow Units

Two shallow hydrogeologic units are present within the study area: recent alluvium and the Pleistocene Terrace deposits. The alluvium consists principally of sand, silt and clay deposited by the meandering streams (especially the Alabama River) of the area. The alluvial deposits reach a maximum thickness of 40 feet in the study area, adjacent to the Alabama River. Ground water occurs in the alluvium under water table (unconfined) conditions. Recharge occurs by precipitation falling on any exposed portions of the unit and from the terrace deposits at higher elevations. Flow proceeds down slope with discharge directed to the Alabama River and the underlying Eutaw, with which the alluvium is in close hydraulic communication. The alluvium is also in contact with the underlying Eutaw. Much of the unit is presently at or below the level of the Alabama because of recent increases in the normal pool elevation of the Alabama. The alluvial aquifer is present along the northeast boundary of Maxwell Air Force Base, usually at elevations below 140 feet, NGVD, within the river Water levels within the unit are usually close to ground surface. The alluvial aquifer does not occur at Gunter Air Force Station.

The ubiquitous terrace deposits form a significant shallow aquifer which is present beneath both Maxwell AFB and Gunter AFS (Knowles, et al., 1963). The unit consists of gravel, sand, silt and clay deposited by meandering streams (ancestral Alabama River) during Pleistocene time. The unit occurs at ground surface at both installations and is probably about 40 to 50 feet thick across the study area. Ground water usually occurs in the unit under water table (unconfined) conditions. Recharge enters the unit primarily as infiltrating precipitation. Both Maxwell AFB and Gunter AFS are located in the recharge area of this aquifer. Terrace deposit ground-water levels at Maxwell range from two feet below ground surface (Moser, 1981) to 10 feet below ground (Knowles, et al., 1960). Ground water depths at Gunter AFS range from 10 to 21 feet below ground surface (test boring data recorded on installation documents).

HYDROGEOLOGIC CROSS-SECTION MAXWELL AFB



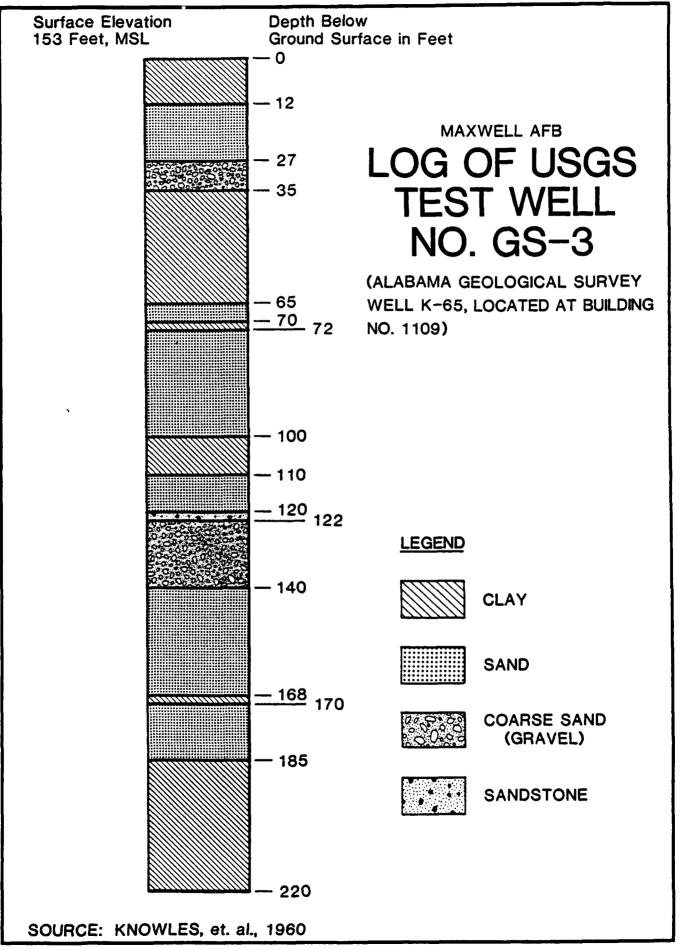


Ground water flow within the terrace materials is probably a subdued replica of the topographic surface; water flow proceeds from higher elevations to low elevations. Discharge is directed to area surface streams and the underlying Eutaw Formation, as little or no effective separation is known to exist between the shallow and deeper aquifers. Deep Units

The deep hydrogeologic units present in the study area are, in order of occurrence, the Eutaw, Gordo and Coker Formations of Upper Cretaceous age. Figure 3.9 depicts the deep units in their stratigraphic relationships in a generalized hydrogeologic cross-section which has been modified from Knowles, et al., (1963).

Eutaw Formation

This unit is a regional aquifer which has been extensively developed in the study area. The Eutaw crops out as an arcuate belt two miles wide and 11 miles long in northern Montgomery County, just east of Maxwell AFB and approximately one mile south of Gunter AFS. It extends beneath both installations where it is unconformably overlain by some 40 feet of Pleistocene Terrace deposits. It is estimated to be 150 feet thick at Maxwell AFB and some 50 feet thick at Gunter AFS (extrapolated from Knowles, et al., 1963, Figure 7). Ground water occurs in the Eutaw under water table conditions in the outcrop area and under artesian conditions elsewhere. The Eutaw is recharged by infiltration of precipitation in its outcrop zones and by downward leakage from alluvial and Pleistocene Terrace deposits. The magnitude of leakage from overlying strata is not known. Natural (pre-pumping) ground-water flow in the Eutaw was most likely down-dip to the south from the principal recharge zones. Extensive water resource development has altered this scenario locally; large-scale drawdowns in the potentiometric surface of the unit probably direct flow towards major pumping centers such as municipal wells. Eutaw Formation artesian water levels were reported to be on the order of 150 feet, MSL at both Maxwell AFB and Gunter AFS (Powell, et al., 1960). Knowles, et al., (1960) reported the depth to water in the Eutaw as 10 feet below land in the well at Maxwell AFB, Building 1109. Figure 3.10 is the log of the well located at Building 1109. At Maxwell AFB, ground-water flow in the Eutaw was postulated to be east toward municipal wells located north of Montgomery, while flow in the same unit



was believed to be southwest with respect to Gunter AFS, toward the same well field. The Eutaw is capable of producing large supplies (1,500 gpm) of water to wells.

Gordo Formation

The Gordo is also considered to be a regional source of water, but is not as prolific as the Eutaw or underlying Coker. It is exposed in Autauga and Elmore Counties, north of Montgomery. In the study area, it is unconformably overlain by the Futaw Formation. It generally occurs at a depth of 200 to 400 feet below surface at Montgomery west well field, located two miles southwest of Maxwell AFB. In Montgomery, the Gordo ranges in thickness from 250 to 300 feet and contains water under artesian conditions. Recharge occurs by infiltration of precipitation in the outcrop area (Autauga and Elmore Counties) and by leakage from overlying units. Formerly (1885), some Gordo wells installed just north of Montgomery flowed naturally under artesian pressures. By 1953 such flow had ceased and water levels declined to about 100 feet below land surface, due to the extensive use of the Gordo as a water supply. reliable, current data is available to describe ground-water flow in the Gordo with respect to Maxwell AFP and Gunter AFS. The Gordo is capable of furnishing modest (200 gpm) supplies of water.

Coker Formation

The Coker is considered to be a prolific aquifer of regional importance. The unit crops out north of Montgomery in Autauga and Elmore Counties and dips gently south. It unconformably overlies crystalline basement rocks and is, in turn, unconformably overlain by the Gordo Formation. At Maxwell Air Force Pase, the Coker occurs at an approximate depth of 500 feet below land surface and is estimated to be 600 feet thick at a test well just west of the installation (interpolated from Powell, et al., 1960, Plate 3). The unit is recharged primarily by infiltrating precipitation in its outcrop area. Reliable current data describing ground-water levels and flow directions is not available. Powell, et al., (1960) reported that as of 1953, ground-water levels in the Gordo and Coker Formations ("Tuscaloosa" aquifers) were similar. It is known that past extensive development of the aquifer and more recently the use of surface water to offset ground-water overdevelopment had at first created large-scale lowering of Coker water levels and then

had permitted some recovery. The Coker is known to be an excellent water source, capable of producing large (1,000 gpm) supplies of water. Base and Area Water Supplies

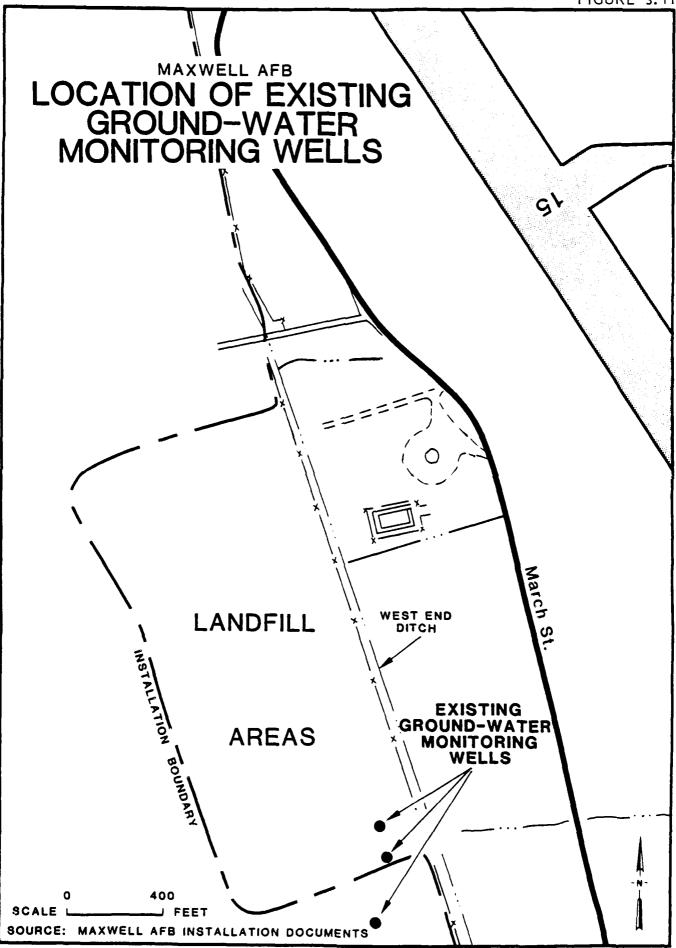
Formerly, Maxwell AFB and Gunter AFS obtained water resources from wells located on the installations. Three inactive wells are located on Maxwell AFB and four inactive wells are located on Gunter AFS and are shown on Figures 3.5 and 3.7, respectively. At present, both installations obtain water resources from the municipal system of Montgomery. The City of Montgomery obtains its water supplies by conjunctive use of both ground and surface waters. The surface water intake is located on the Tallapoosa River, near the confluence of the Coosa and Alabama Rivers. The municipal well system consists of forty-five wells located west and north of the urban area. Six of the wells are located near the southeast corner of Maxwell Air Force Base. Typically, city wells located west of the urban area are screened into both the Gordo and Coker Formations. Some wells located north of the city were reported to be screened into the Eutaw (Powell, et al., 1960). It is unlikely that the terrace and alluvial deposits are used as water sources in the study area.

Ground-Water Quality

Powell, et al., (1960), Knowles, et al., (1963) and Scott (1983) report that water resources obtained from the Eutaw, Gordo and Coker Formations are generally very good. Wells screened into the upper extent of the Eutaw may encounter excessive amounts of iron locally. Bryant (1983) reports that the quality of water obtained from city wells is good, however, specific water quality analyses results for these wells were not available.

Installation Ground-Water Monitoring

At present, a ground-water monitoring system consisting of three shallow wells is being utilized to observe terrace deposit water quality near the active landfill (Figure 3.11). According to installation information (furnished August 1983) and Moser (1981), water levels adjacent to the landfill ranged from seven feet below land surface to 35 feet below ground, respectively. During an inspection of the facility's open trench, seepage into the pit which may be ground water, was observed. A comparison of trench depth and indicated water levels suggests that disposed wastes and terrace deposit ground water are in

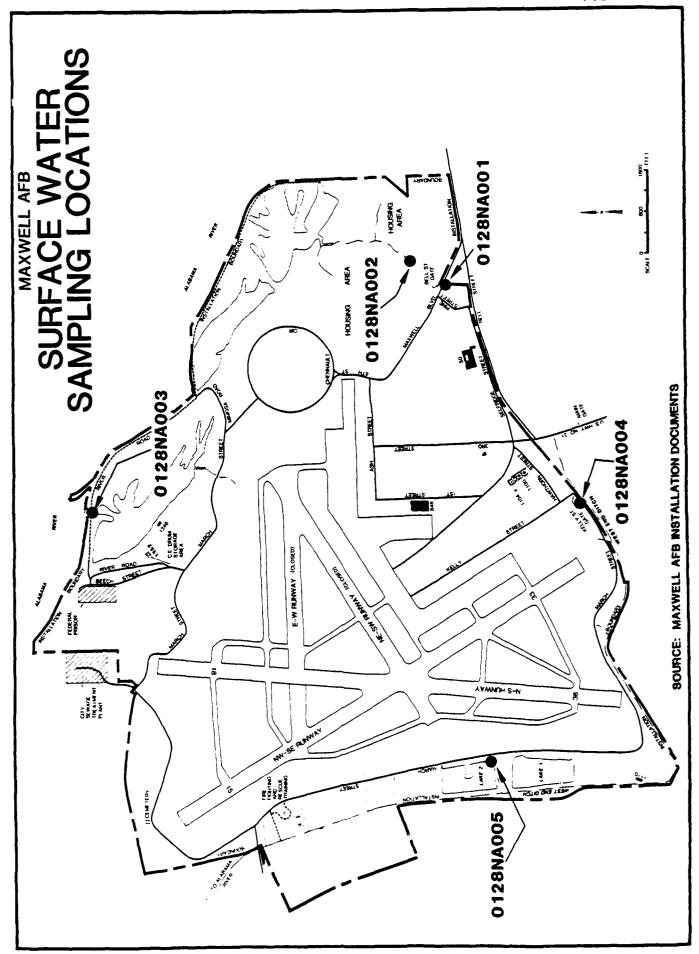


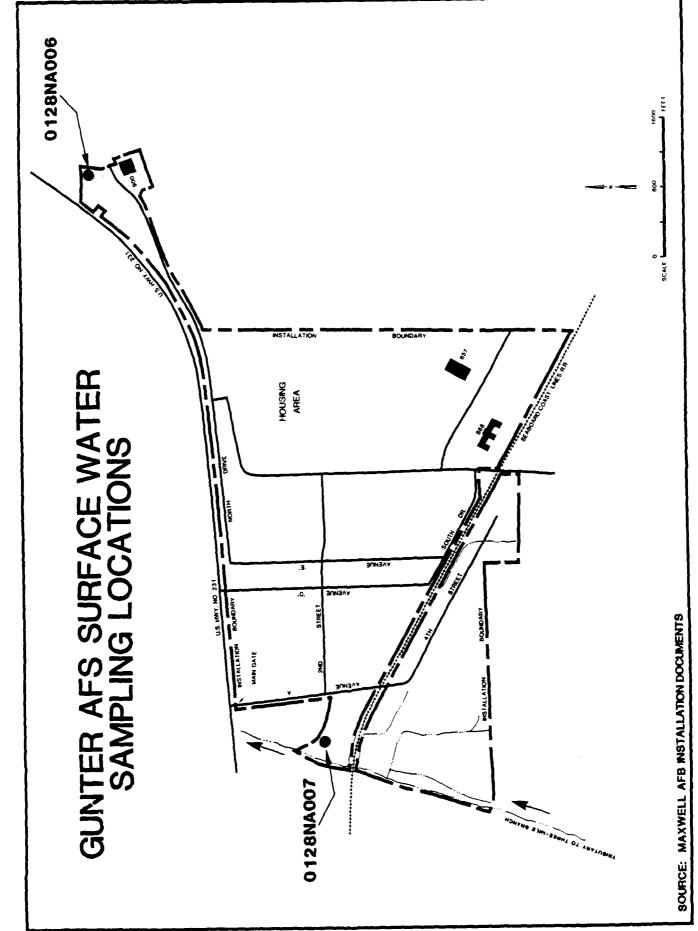
contact, at least seasonally. It is not possible to assess the appropriateness of the monitoring data as it is uncertain that monitoring wells have been installed in the proper locations with respect to buried waste materials and that the wells have been sampled correctly. No accurate ground-water elevations were available to evaluate the ground-water flow direction relative to the buried wastes.

Assuming that terrace deposit ground-water flow follows topographic influences, then discharge to the West End Ditch would be expected. Because the downgradient wells are apparently installed on a line parallel to the active trench, but south of same, it would seem that these wells are not situated properly to intercept migrating contamination, should it exist. Also, because driller's logs and monitoring well installation details were not available, it is not known how the wells were constructed or if they tap a zone from which representative ground-water quality samples may be obtained. Also, the method of sample collection utilized by the outside contractor involved obtaining grab samples of ground water from each well without first pumping out the stagnant water then letting the well recharge with representative effluent.

Surface Water Quality

Pase personnel routinely collect and analyze water samples from various surface drainage locations on Maxwell AFP and Gunter AFS in accordance with NPDES Permit No. AL0003727 and AL0003719, respectively. The locations of the five monitoring points for Maxwell AFP are shown in Figure 3.12 and the two locations for Gunter AFS are shown in Figure The parameters for each sampling point have included flow, pH, oil and grease, suspended solids, temperature and fecal coliform. Sampling point 0128NA001 is the influent of the surface drainage from a portion of the City of Montgomery to the east side of Maxwell AFr. Sampling point 0128NA003 on Maxwell AFP and sampling points 0128NA006 and 0128NA007 on Gunter AFS monitor surface drainage effluents exiting the installations. Sampling point 0128NA002 on Maxwell AFP monitors a drainage stream prior to discharge into an on-base lake while sampling points 0128NA004 and 0128NA005 monitor surface drainage streams prior to discharge into the West End Ditch. None of the sampling points monitor





West End Ditch directly. A review of the NPDES monitoring data for the period May 16, 1979 through March 31, 1983, indicated no water quality problems at the required sampling points.

Peginning in May 1982, the number of parameters analyzed at 0128NA001 (influent to the base) was expanded to include cyanide, phenols, arsenic, cadmium, lead and mercury. A summary of the sample analysis data is shown in Appendix E, Table E.1. The data indicates that elevated levels of arsenic (1.5 mg/l maximum) and lead (1.3 mg/l maximum) are present in the surface drainage entering the base. Levels of phenols and oil and grease are also indicated. Levels of cyanide, cadmium and mercury were negligible or less than detectable limits. The surface drainage flows through 0128NA002 on the east side of the base and enters a series of on-base lakes which drain to the Alabama River. The source or sources of the off-base contaminants have not been identified.

Endangered Species

There are no known endangered or threatened species of plants or animals on either Maxwell AFP or Gunter AFS.

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicated that the following major items are relevant to the assessment of past hazardous waste management practices at Maxwell Air Force Base and Gunter Air Force Station:

- o Study area mean annual precipitation is reported to be 52.1 inches and net precipitation was calculated to be approximately eight inches which represents the meteoric water available for infiltration. The 24-hour maximum rainfall event is 6.3 inches.
- o Much of Maxwell AFB is located in the zone flooded by a 100-year event. Gunter AFS is located above the 100-year flood zone.
- o Surface soils at both Maxwell AFB and Gunter AFS tend to be moderately to poorly permeable, but are underlain by highly permeable soils at shallow depths.

- o The terrace deposit aguifer is present at ground surface at both Maxwell AFB and Gunter AFS. Water levels in this unit are shallow (3.5 to 7 feet below ground).
- o The terrace deposits form the shallow aguifer in the study area and directly overlie and provide recharge to the Futaw, which is present at shallow depth (40 feet) below ground surface. The Eutaw is a major regional aguifer. No separation exists between the terrace materials and the Eutaw. The water level in the Eutaw was measured at 10 feet below ground surface in a well at Maxwell AFB.
- o Two major regional aquifers, the Gordo and Coker exist below the Eutaw and communicate with it. The city obtains most of its ground-water supplies from these two aquifers.
- o Contaminants including arsenic and lead are entering the base through the surface drainage influent from a portion of the City of Montgomery on the east side of Maxwell AFB.
- o No known endangered or threatened species of plants or animals exist on either Maxwell AFB or Gunter AFS.

From these major points it may be noted that potential pathways for the migration of hazardous waste-related contamination exist. Hazardous materials present at ground surface could be mobilized to the area's shallow aguifer (terrace deposits) and subsequently discharged to local surface streams or transferred to the underlying Futaw or Gordo Formations as recharge.

SFCTION 4 FINDINGS

To assess hazardous waste management at Maxwell AFP and Gunter AFS, past waste generation and disposal methods were reviewed. This section summarizes the hazardous waste generated by activity; describes past waste disposal methods; identifies the disposal sites located on the base; and evaluates the potential for environmental contamination.

PAST SHOP AND BASE ACTIVITY REVIEW

To identify past base activities that resulted in generation and disposal of hazardous waste, a review was conducted of current and past waste generation and disposal methods. This activity consisted of a review of files and records, interviews with current and former base employees, and site inspections.

The source of most hazardous wastes on Maxwell AFP and Gunter AFS can be associated with one of the following activities:

- o Industrial Operations (Shops)
- o Pesticide Utilization
- o Fuels Management
- o Fire Protection Training
- o Waste Storage Areas

The following discussion addresses only those wastes generated on Maxwell AFB and Gunter AFS which are either hazardous or potentially hazardous. In this discussion a hazardous waste is defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CFRCLA). A potentially hazardous waste is one which is suspected of being hazardous, although insufficient data are available to fully characterize the material.

Industrial Operations (Shops)

A large number of the shops and related operations at Maxwell and Gunter utilize hazardous materials. Many are consumed in the process and do not result in a waste material for disposal. Appendix D lists the shop activities which handle hazardous materials and generate hazardous waste. The present shop locations and treatment, storage and disposal methods are also indicated in Appendix D. These data were developed from the Bioenvironmental Engineer's files and interviews with shop employees.

Interviews were conducted with several long-time shop employees at Maxwell and Gunter. These interviews were supplemented by a careful review of the bioenvironmental engineer files and ar internal Air Force report (AF OFML, 1969) which dealt with industrial waste discharges at Maxwell. A summary of the shop activity review is presented in Table 4.1. The shop name (past and present), waste materials, approximate quantities of waste, and the disposal procedures are included. Shops which generate small quantities of wastes are not indicated in Table 4.1.

The information in Table 4.1 shows estimated timelines for hazardous waste management practices by shop and by waste material. The solid lines indicate those practices which were confirmed while the dashed line indicates the practices which were assumed to have been in effect. Waste quantities listed in Table 4.1 are based on present or most recent data available. If no quantity data were available, best estimates were made from discussions with interviewees.

As previously discussed in Section 2, the flying activities at Maxwell have steadily declined. The primary flying missions occurred at Maxwell AFB from 1941 to 1946 and from the 1950's to early 1960's. Aircraft shops at Gunter AFS were active from 1942 until 1949. Shop interviewees estimated that the current shop quantities would represent approximately one-half to one-third the waste disposal quantities of past years at Maxwell AFP. A comparison of past shop quantities with present quantities at Gunter AFS could not be made.

From the 1940's to 1974, most of the combustible liquid wastes such as oils, fuels, thinners and solvents were drummed and taken to the fire protection training areas at Maxwell AFP for burning. In 1974, this

Waste Management

				1 of 7
SHOP NAME	LOCATION (BLDG, NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
3800 AIR BASE WING (ABW)/ 908 AIR RESERVE GROUP (CONSOLIDATED MAINTENANCE)				
AEROSPACE GROUND EQUIPMENT (AGE)	1023/1025	DIESEL FUEL	55 GALS. /YR.	1940 FPTA DPDO
		PD-680/PS-661	55 GALS. /YR.	FPTA DPDO
		OILS	330 GALS. /YR.	FPTA DPD0
		HYDRAULIC FLUID	120 GALS. /YR.	FPTA DPDO
		ALKALINE DESCALER, PAINT STRIPPER & PD-680	450 GALS./YR.	FPTA OBC
ELECTRIC/BAT FERY	80	PD-680/PS-661	220 GALS. /YR.	1955 FPTA OR SYSTEM OBC
		ACID & ALKAL!	156 GALS./YR.	SANITARY SEWER SANITARY SEWER
NON-DESTRUCTIVE INSPECTION	80 87 80	PENETRANTS	110 GALS. /YR.	SURFACE DRAINAGE SYSTEM DPD0
		EMULSIFIERS	110 GALS. /YR.	SURFACE DRAINAGE SYSTEM DPDO
		DEVELOPERS	15 GALS./YR.	SURFACE DRAINAGE SYSTEM SAMITARY SEWER
		FIXER SOLUTION	3 GALS. /YR.	SURFACE DRAINAGE SYSTEM DPDO

KE Y

-CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL ----ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA - FIRE PROTECTION TRAINING AREA

OBC - OFF-BASE CONTRACTOR

Waste Management

				2 of 7
SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1970 1980
CORROSION CONTROL/PAINT	848	PAINTS & THINNERS	600 GALS. /YR.	1940 FPTA 0BC
		WATERFALL FFFLUENT AND SLUDGE	4000 GALS. /YR.	SURHACE DRAINAGE SYSTEM OBC
PNEUDRAULICS SHUP	848	PD-680/PS-661	110 GALS. /YR.	1
	·	HYDRAULIC FLUID	3 CALS. /YR.	FPTA DPDO
MACHINE SHOP	87 8 7 8	MACHINE OIL & PD-680/PD-661	1 GAL./YR.	FPTA DPDO
AIRCRAFT WASHING & PAINT STRIPPINC	W OF 689	CALLA 301 & PD-686/PS: 651	NOT AVAILABIF	SURFACE DRAINAGE SYSTEM 74 CLOSED
	E OF 847	PAINT STRIPPER & CLEANING SOLVENT	NOT AVAILABLE	SURFACE DRAINAGE SYSTEM
	S OF 645	FD-680/PS -661	NOT AVAILABLE	SURFACE DRAINAGE SYSTEM
	N OF 1025	COMPOUND	100-200 GALS. /WK.	SURFACE DRAINAGE SYSTEM DRAINAGE SYSTEM
908 AIR RESERVE GROUP (MAINTENANCE)				
FLICHTI INF MAINTENANCE	689	HYDRAULIC FLUID	INCLUDED WITH BLDG. 848	(COMBINED WITH 3800 ABW)

KEY

-----CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA - FIRE PROTECTION TRAINING AREA

OBC OFF-BASE CONTRACTOR

Waste Management

			•	3 of 7
SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
ENGINE /PROPELLOR	848	PD-680/KEROSENE	60 CALS. /YR.	1969 FPTA DPDO
		OIL	420 GALS./YR.	FPTA DPDO
TIRE SHOP	80	PD-680	500 GALS. /YR.	FPTA DPDO
3800 ABW/MAINTENANCE				
FLICHTLINE MAINTENANCE (INCL.	82 82 83	PD-680/PS-661	110 GALS. /YR.	1940 FPTA DPDO
FLICHTLINE MAINTENANCE)		p-4	110 GALS. /YR.	FPTA
		OIL & HYDRAULIC FLUIDS	110 GALS. /YR.	FPTA DPDO
ELECTROPLATING SHOP	80 87 80	PLATING BATHS(Cu, Ni, Cr & Cd)	240 GALS./YR. (WHEN DUMPED)	WASTE DISPOSAL SITE NO WASTES CLOSED
		RINSEWATER	100,000 GALS./YR.	SURFACE DRAINAGE SYSTEM CLOSED
		ACIDS	SO CALS. I'YR.	SURFACE DRAINAGE SYSTEM CLOSED
		TRICHLOROETHYLENE SLUDGE	50 CALS. /YR.	AVAILABLE LANDFILL CLOSED
	-			

KEY

------CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA - FIRE PROTECTION TRAINING AREA OBC - OFF-BASE CONTRACTOR

:-5

Waste Management

				d of 7
SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
AIRCRAFT CLEANING, REPAIR &	1023	ALKALINE DERUSTER	1200 GALS. [TR.	1967 1973 FPTA FALTADY CEMED
	342	COMPOUNDS	1320 GALS. /YK.	CLOSED
		SKIN BRIGHTENER	1320 GALS./YR.	SANITARY SEWER
		ALODINE 1200	660 GALS./YR.	SANITARY SEWER
	843	PAINT WASTES (MEK)	UNKNOWN	FPTA CLOSED
ABW/SUPPLY				
FUELS STORAGE/INSPECTION	1,101/1604	AVGAS	SO GALS. /YR.	1940 FPTA OR DPDO DPDO WASTE
		₩-df	50 GALS./YR.	FPTA 1.8 DPDO DPDO WASTE
		TANK SLUDGES	275 GALS./4 YRS.	WEATHERED TO LANDFILL
VEHICLE MAINTENANCE	936	OILS	1980 GALS./YR.	
		PAINT WATERFALL EFFLUENT	6000 GALS. /YR.	SURFACE DRAINAGE SURFACE DRAINAGE SYSTEM
		KADIA FOR CLEANER	1 GAL./YR.	SURFACE DRAINAGE SYSTEM DRAINAGESYSTEM
REFUELING VEHICLE MAINTENANCE	1063	OILS	250 GALS. /YR.	FPTA DPD0

KEY

FPTA - FIRE PROTECTION TRAINING AREA UBC - UFF-BASE CONTRACTOR

INDUSTRIAL OPERATIONS (Shops)

Waste Management

				5 of 7
SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1960
LAWN MOWER MAINTENANCE	ħ26	9115	2670 GALS. /YR.	1940 FPTA DPDO
ABW/MORALE, WELFARE & RECREATION AUTO/WOOD HOBBY SHOP	1067	OIL, SOLVENT, KEROSENE	1820 GALS. /YR.	FPTA DPDO
ABW/BASE CIVIL ENGINEERING PROTECTIVE COATING/PAINT	78	PAINTS, THINNER & STRIPPER	350 GALS. /YR.	FPTA OBC
		WATERFALL SLUDGE	20 CALS. /YR.	LANDFILL
HEATING SYSTEMS MAINTENANCE	78	CLEANING SOLVENT	290 GALS. /YR.	FPTA DPDO
		CUTTING FLUID	2 GALS./YR.	<u> </u>
POWER PRODUCTION	82	OIL & FUEL	110 GALS. /YR.	FPTA OBC
REFRICERATION/AIR CONDITIONING	82	PD-680/PS-661	110 GALS./YR.	FPTA USE OF SOLVENT
FIRE PREVENTION	1043	CHLOROBROMOMETHANE	10 GALS. /YR.	DISCHARGED TO GROUND OBC

KEY

----ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

FPTA - FIRE PROTECTION TRAINING AREA OBC - OFF-BASE CONTRACTOR

INDUSTRIAL OPERATIONS (Shops) Waste Management

SHOP NAME (BLOG NO.) PAVEMENTS/GROUNDS AND CCLT COURSE MAINTENANCE INMI EMPTY CONTAINERS SOO ARE BASE SOUADRON (ABS)/ CLVIL ENGANEERING (GUNTE ARB) PAVEMENTS AND CROUNDS EMPTY CONTAINERS SOO ARE BASE SOUADRON (ABS)/ CLVIL ENGANEERING (GUNTE ARB) PAVEMENTS AND CROUNDS EMPTY CONTAINERS SOO ARE BASE SOUADRON (ABS)/ CRVIL ENGANEERING (GUNTE ARB) PAVEMENTS AND CROUNDS EMPTY CONTAINERS SOO ARE BASE SOUADRON (ABS)/ CRVIL ENGANEERING (GUNTE ARB) PAVEMENTS AND CROUNDS EMPTY CONTAINERS SOO CALS./MO. EMPTY CONTAINERS SOO CALS./MO. EMPTY CONTAINERS SOO CALS.//RO. THINNERS SOCALS.//RO. THINNERS SOCALS.//RO.			Waste Management	agement	7 90 9
ROUNDS AND 1334 (ALSO 1013) EMPTY CONTAINERS MAINTENANCE 1441 PESTICIDE RINSEWATER EMPTY CONTAINERS S60 PESTICIDE RINSEWATER EMPTY CONTAINERS S03 PESTICIDE RINSEWATER EMPTY CONTAINERS COATING/PAINT S12 PAINT RESIDUALS THINNERS		OCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	метнор(s) оғ TREATMENT, STORAGE & DISPOSAL 1950 1960 1970 1980
M (ABS)/ ER AFS) S60 PESTICIDE RINSEWATER EMFTY CONTAINERS 503 PESTICIDE RINSEWATER EMPTY CONTAINERS FAINT RESIDUALS THINNERS	PAVEMENTS/GROUNDS AND ENTOMOLOGY	1334 (ALSO 1013)		10 GALS./WK. 5 - 10/A1O.	SANITARY SEWER SEWER UMRINSED TO CROUND SEWER SEWER SEWER SEWER
S60 PESTICIDE RINSEWATER EMPTY CONTAINERS S03 PESTICIDE RINSEWATER EMPTY CONTAINERS S12 PAINT RESIDUALS THINNERS	GCLF COURSE MAINTENANCE		PESTICIDE RINSEWATER EMPTY CONTAINERS	10 - 15 CALS./WK. 5 - 10/MO.	DISCHARGED TO GROUND UNRINSED TO LANDFILL
EMPTY CONTAINERS 503 PESTICIDE RINSEWATER 503 PESTICIDE RINSEWATER EMPTY CONTAINERS THINNERS S12 PAINT RESIDUALS THINNERS	3800 AIR BASE SQUADRON (ABS)/ CIVIL ENGINEERING (GUNTER AFS)				
SO3 PESTICIDE RINSEWATER S EMPTY CONTAINERS COATING/PAINT S12 PAINT RESIDUALS THINNERS S1	PAVEMENTS AND GROUNDS	260	PESTICIDE RINSEWATER EMPTY CONTAINERS	5 - 10 GALS. /MO. 2 - 5/MO.	DISCHARGED TO SURFACE DRAINAGE SYSTEM RINSED TO HARDFI' AREA SANITAR LANDFILL
512 PAINT RESIDUALS THINNERS	ENTOMOLOGY	503			SANITARY SEWER RINSED TO HAKUFILL AREA SANITARY LANDFILL
	PROTECTIVE COATING/PAINT	512	PAINT RESIDUALS THINNERS	15 GALS. /YR. 55 GALS. /YR.	LEASED LANDFILL LANDTILL MAXWELL FPTA OBC

KEY

--- CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL -----ESTIMATED TIME-FRAME DATA BY SHOP PFRSONNEL

FPTA FIRE PROTECTION TRAINING AREA OBC OFF BASE CONTRACTOR

Waste Management

			480mcm	7 00 7
SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL
ABS/MORALE, WELFARE & RECREATION (GUNTER AFS)				
АОТО НОВВУ ЅНОР	715	онг	1980 GALS. /YR.	1940 MAXWELL FPTA DPDO
ABS/TRANSPORTATION (GUNTER AFS)				
VEHICLE MAINTENANCE	715	011.5	110 GALS./YR.	MAXWELL FPTA DPDO
ABS/MAINTENANCE (GUNTER AFS)				
ENGINE OVERHAUL	857	OILS	NOT AVAILABLE	1951 DPDO OR FPTA 1971

KEY

-----CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

----ESTIMATED TIME-FRAME DATA BY SHOP PERSONN'IL

FPTA - FIRE PROTECTION TRAINING AREA OBC OFF-BASE CONTRACTOR

practice was discontinued and these wastes were either stored at the point of generation at Maxwell AFP or Gunter AFS or taken to a drum storage area at Facility 1352. Arrangements were made through Ease Civil Engineering and/or Defense Property Disposal Offices (DPDO) to sell the material to a waste oil contractor.

From the 1940's to the early 1970's, aqueous industrial waste solutions from the Maxwell AFP shops were discharged to the surface drainage system which discharges to West End Ditch and the Alabama River. The solutions included washrack wastewater, paint stripper, dilute acids and dilute caustics. Since the early 1970's oil/water separators have been installed and neutralization of acid and caustic wastes is practiced.

From the 1940's to the mid-1970's, some industrial wastes were disposed of in landfills around Maxwell. Electroplating wastes generated during the late 1940's through the mid-1960's were drummed and disposed of in landfill areas around Hopper Lodge (Bldg. 1110). During the peak plating years (mid-1950's to early 1960's), it is estimated between four and five drums of spent plating solutions were disposed of on at least five to ten occasions. Beginning in the mid-1960's, the plating solutions were regenerated which elim: nated the need for on-site The plating operations were closed in the early 1970's and disposal. the remaining solutions were transported to Kelly Air Force Pase for final disposal in the mid-1970's, Also, a small quantity of trichloroethylene sludge from the plating shop was occasionally disposed of in the active sanitary landfills during the 1950's and 1960's. Waste paints, paint cans, paint spray booth slucges and rinsed pesticide containers were also disposed of in the active samitary landfills from the 1940's to the present.

Pesticide Utilization

A variety of pesticides (insecticides, herbicides, fungicides, and redenticides) are used at Maxwell AFE and Gunter AFS installations. Use of the pesticides is under the direction of the Entomology Shop, Pavement and Grounds and golf course maintenance personnel. Appendix E (Table F.2) summerizes the pesticides currently in use.

Since 1977, precautions have been taken in handling and disposing of pesticide materials. At Maxwell AFP, all unused solutions in sprayers from Pavement and Grounds have been transferred to storage containers

for later use. Pesticide containers have been rinsed and taken to the sanitary landfill. Container and sprayer rinsewater is drained to the sanitary sewer. Prior to about 1977, unrinsed empty containers were taken to the active sanitary landfill. Rinsewater from equipment cleaning was poured on the grounds near Building 1334. In the years preceding approximately 1972, this practice took place near Puilding 1013.

At the golf course maintenance shop, most pesticide chemicals used were delivered in bags. The empty bags and a small number of empty containers are taken to the active sanitary landfill. Unused pesticide solutions and rinsewaters were discharged on the grounds at various locations throughout the golf course.

At Gunter AFS, unused pesticide solutions at the Entomology Shop have been stored in a 55 gallon drum for pickup by a contractor. Pesticide container rinsewater is discharged to the sanitary sewer. The Pavement and Grounds Shop pesticide containers at Gunter AFS are rinsed in the yard outside Building 560 and drained onto the ground. All rinsed containers and bags from Gunter AFS are currently sent to the Maxwell AFB sanitary landfill. However, some may have been buried in the past at the existing hardfill area at Gunter AFS which is presently used for disposal of landscape and construction debris.

Fuels Management

A listing of the fuel storage tanks at Maxwell AFP and Gunter AFS is presented in Table 4.2. These tanks are used to store JP-4, AVGAS, MOGAS, Diesel Fuel No. 2, and Fuel Oil No. 5.

The tanks at the main fuel storage area (Facility No. 1100) at Maxwell AFB are above ground and have earthen containment dikes. All other tanks in use at Maxwell AFB and Gunter AFS are underground except 30 small above ground MOGAS and diesel fuel tanks.

The bulk fuel storage area at Maxwell AFB can be and has been supplied by a 4-inch diameter pipeline in past years but is currently supplied by trucks. Rail service can also be used as needed. The inactive pipeline enters the base from the southwest corner and ends at Facility No. 1100 storage yard which is paved. Drainage from the truck unloading area and the storage containment area flows to two oil/water separators.

TABLE 4.2
SUMMARY OF MAJOR FUEL STORAGE TANKS
MAXWELL AFB AND GUNTER AFS

Iten	Pacility Number	No. of Tanks	Tota_ Storage Capacity	Storage Above or Below Ground
MAXWELL AFB				
JP -4	1100	2	934,000	Above
A VGAS	11 OC	2 (1)	49,000	Above
MOGAS	1100	1	11,000	Above
Fuel Oil No. 2	1100	1	227,000	Above
Diesel Fuel No. 2	91 3	1	10,000	Below
HOGAS	913	2	21,000	Below
MOGAS	1112	3	30,000	Below
AVGAS	843	1	2,000	Below
AVGAS	1037	6 ⁽²⁾	150,000	Below
Kerosene	1037	1 (2)	1,c oo	Below
Fuel Oil No. 2	1037	3 ⁽³⁾	33,C00	Above
Fuel Oil No. 5	1410	5	100,000	Below
Fuel Oil No. 2	(4)	26 (4)	98,000	Below
10GAS	(5)	12(5)	4,000	Above/Selow (6)
Diesel Fuel No. 2	(7)	18 ⁽⁷⁾	16,000	Above/Below ⁽⁶⁾
GUNTER AFS				
MOGAS	408	2	25,000	Below
HOGAS	813	5	15,000	Below
Diesel Fuel No. 2	85 7	4	92,000	Below
Diesel Fuel No. 2	(8)	16'3)	39,000	Belov
40GAS	(9)	4 ⁽⁹⁾	1,000	Above/Felow (6)

⁽¹⁾ One tank normally not used.

⁽²⁾ Abandoned - filled with water.

⁽³⁾ Not used.

⁽⁴⁾ Numerous locations at base; sizes range from ',000 - 12,000 gal.

⁽⁵⁾ Numerous locations at base; sizes range from 2 - 1,000 gal.

⁽⁶⁾ Large tanks below ground and small ones usually above.

⁽⁷⁾ Numerous locations at base: sizes range from 2C - 2,500 gal.

⁽a) Numerous locations at station; sizes range from 350 - 3,500 gal.

⁽⁹⁾ Several locations at station; sizes range from 5 - 600 gal.

The main fuel storage tanks and appurtenances are inspected daily for leaks. The underground tanks are checked for water each time they are filled. When water is found further testing is performed to determine possible leakage. No major leaks have been reported.

The six main tanks receiving fuel at Facility 1100 are periodically cleaned. AVGAS and JP-4 fuel tanks have been cleaned about every four years. Sludge quantity withdrawn from each tank during cleaning is estimated to be approximately 55 gallons. The sludge has been weathered in isolated areas usually near the on-base landfill active at the time the tanks are cleaned. The sludge is normally weathered for a period of four weeks prior to disposal in the landfill.

There have been several instances of minor spillage of fuels at storage tanks (during filling) and on the flightline. Flightline spills are usually washed to the surface drainage system. There have been several spills/leaks reported by fuels management personnel. Table 4.3 summarizes the information available concerning the spills and leaks.

Due to the relatively small amounts of the spills/leaks and the clean-up efforts made on the larger spills/leaks, these incidents are not believed to pose a potential for waste contamination or migration.

Fire Protection Training

Limited fire protection training activities were conducted on Gunter AFS through the late 1940's. One or more areas were believed to have been used to conduct the exercises on an as-needed basis. All fire protection training activities ceased at Gunter AFS in the late 1940's and Gunter AFS fire protection personnel participated in training exercises at Maxwell AFB from that time to the present. Fire protection training activities have been conducted on Maxwell AFP in two areas on base. A description of each area is given below.

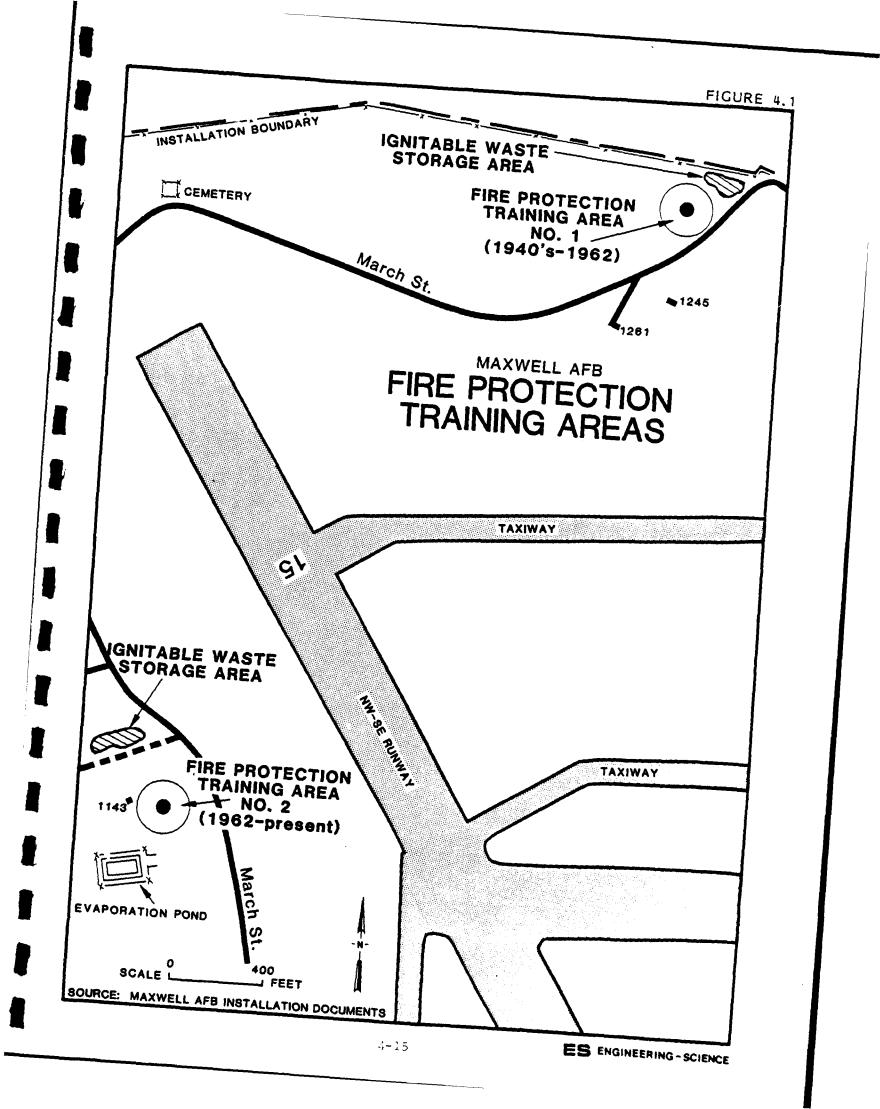
Fire Protection Training Area No. 1

Fire protection training exercises were conducted in the area presently used for disposal of landscape debris and construction rubble as shown in Figure 4.1. This location was utilized from the early 1940's to about 1962. The training area consisted of a shallow unlined depressed area no more than 12 inches deep in the center. Training exercises were conducted primarily on weekends and usually two to three

TABLE 4.3

SPILLS AND LEAKS OCCURRING ON MAXWELL AFB AND GUNTER AFS

Approximate Date	Description	Location	Material Spilled/ Leaked	Approximate Quantity Spilled/ Leaked (gallons)	Approximate Quantity Recovered (gallons)	Remarks
MAXWELL APB						
1978	Pipeline leak	Near south and of the NW-SE runway.	*	1,000+	900	No visual evidence of contamination.
1972	Pipeline leak	Near south perimeter road and the skeet range.	JP - 4	300+	0	No visual evidence of contamination.
1968	Truck overflow during filling.	POL tank farm.	₹ -år	(unknown)	•	Contaminants flush- ed to surface drainage system.
1961	Hose failure during truck filling.	POL tank farm.	JP -4	(unknown)	•	Contaminants flush- ed to surface drainage system.
GUNTER AFS	Pipeline leak	Base service station.	HOSAS	300+	۰	No visual evidence of contamination.



exercises would be conducted per day. High pressure water was used for extinguishing fires.

Prior to each exercise the pit area would be soaked with water. Waste oils, waste fuels, waste shop solvents and other ignitable wastes were stored on an embankment near the area of the fire pit (Figure 4.1). Between 10 and 20 full or partially full drums were stored at the site. Occasionally, the waste fuels and solvent would be washed out of the pit area during an exercise into a small pond located nearby. The training pit area and pond have been filled in and covered over with several feet of soil, landscape debris and construction rubble.

Fire Protection Training Area No. 2

In 1962, fire protection training activities were moved to the present location as shown in Figure 4.1. Initially the training area was constructed as a shallow unlined pit about 12 inches deep in the center and 35 feet in diameter. Protein foam, AFFF and Halon were used as an extinguishing agents at this site.

For the period 1962 through 1973, the practice of using waste oils, waste fuels, waste solvents and other ignitable wastes for the training exercises continued. Drums of these waste materials were delivered to a holding area just north of the fire pit (Figure 4.1). Between 25 and 35 drums were frequently stored at this location. Some leakage from these drums was believed to have occurred. A list of these wastes is shown in Table 4.4. Prior to each exercise the pit area was soaked with water then the ignitable materials were poured in the pit to conduct the training exercise. At the conclusion of the exercise residue materials and water soaked into the pit area. Occasionally throughout the period 1962 through 1978, water and residual waste ignitable materials would overflow from the pit area to West Fnd Ditch.

In 1978 a concrete liner, sump, oil/water separator and evaporation pond system was constructed over the unlined fire pit area. This system is operating at present. Any residual fuel is separated and collected while any water is discharged to the evaporation pond and allowed to evaporate. The evaporation pond is unlined and has no discharge to surface waters.

TABLE 4.4

INDUSTRIAL WASTES CONSUMED FOR FXERCISES AT FIRE PROTECTION TRAINING AREA NO. 2

(1962 through 1974)

Item	Disposal Quantity (gallons)	Disposal Interval
Paint Stripper	50-70	Yearly
Dope, Enamel and Lacquer Thinners	20	Weekly
PS-661/PD-680	2	Weekly
Motor Oil, Brake Fluid and Hydraulic Fluid	55	Weekly
Methyl Ethyl Ketone (MEK)	(unknown)	(unknown)
Alkaline Deruster	300	1 per 3 mos.
Kerosene	9	weekly
Aircraft Engine Oil	10	weekly
Carbon Remover	165	1 per 2 yrs.

Source: AF OEHL, 1969, and installation documents.

For the period 1973 to the present, the practice of burning waste fuels, oils and solvents has been discontinued and only JP-4 with 10 percent or less contamination has been used.

Waste Storage Areas

From the mid-1970's to the present, several facilities have been used for the storage of waste petroleum products and waste shop chemicals. Many petroleum wastes are stored in drums at or near the point of generation. Civil Engineering arranges for a contractor to pump out the wastes on an as-needed basis. The Auto Hobby Shop (Pldg. 1067) maintains an underground waste oil tank which is also pumped out by a contractor on an as-needed basis.

Shop chemical wastes are stored either near the aircraft washrack (Bldg. 1025) or at the C.E. drum storage area (Figure 4.2). An off-base contractor was used to collect and dispose of these wastes on an as-needed basis. From the mid to the late 1970's, drums were stored on an unlined ground area. Since the late 1970's, drums at the C.F. storage area have been stored on a concrete pad which drains to an oil/water separator. A visual inspection of the concrete pad and surrounding area indicated minor spillage may have occurred.

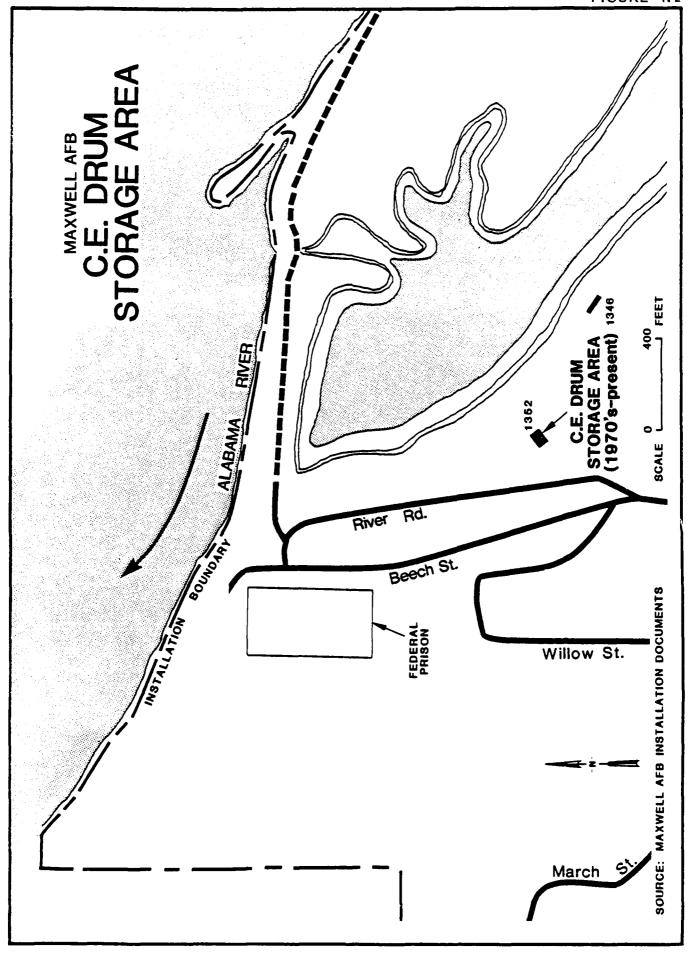
DESCRIPTION OF PAST DISPOSAL METHODS

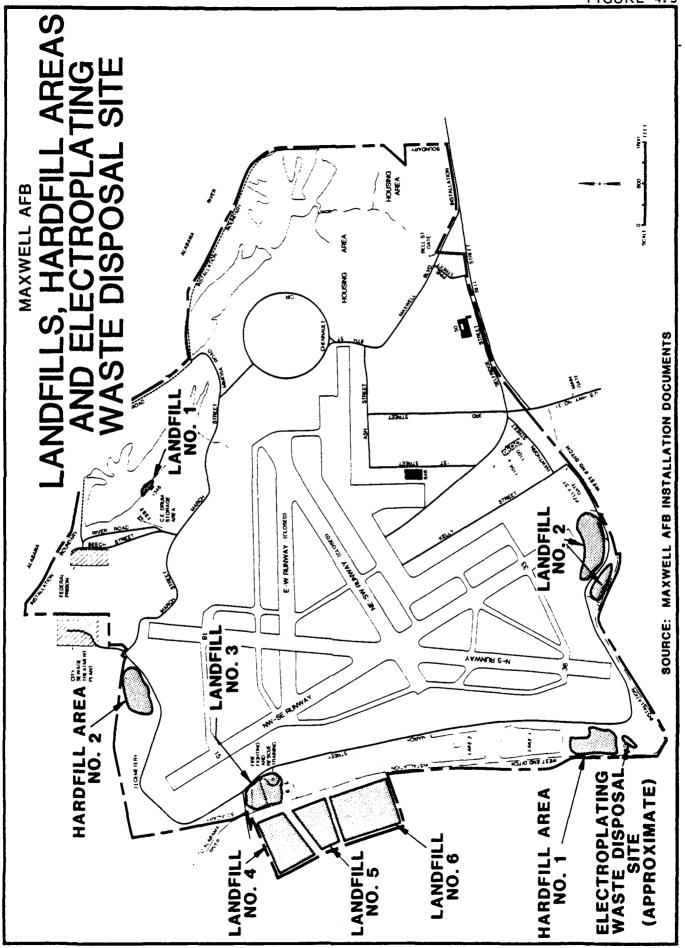
The facilities at Maxwell AFB and Gunter AFS which have been used for the management and disposal of wastes can be categorized as follows:

- o Landfills
- o Hardfill Areas
- o Electroplating Waste Disposal Site
- Sanitary Sewer System
- o Surface Drainage System
- o Incinerators

Landfills

Six past and present landfills have been identified on Maxwell AFF. The landfills on Maxwell AFB are located around the north, west and south installation boundaries as shown in Figure 4.3. The data for each landfill is summarized in Table 4.5. Descriptions of the individual sites are given below.





TAPLE 4.5
SUMMARY OF LANDFILLS, HARDFILL ARFAS
AND FLECTROPLATING WASTF DISPOSAL SITF

	rigure No.	Period of Operation	Approximate Size (acres)	Types of Wastes	Method of Operation	Closure Status	Drainage	Site Visit Comments
LANDFILLS								
Lendfill No. 1	4.2	1930.	5 to 10	Some garbage, base trash, construction rubble.	Area fill with burning.	Covered embankment, To golf course lakes.	To golf course lakes.	No evidence of contami- nation,
Landfill No. 2	4.5	Early 1940's- 1951	20	Garbage, base trash, industrial sludges, paints.	Trench 6 fill Depth: 10 feet.	Closed and covered. To West End Ditch.	To West Fnd Ditch.	No evidence of contami- nation.
Landfill No. 3	9:	1951-1956	0	Garbage, base trash, industrial sludges, paints.	Trench & fill Depth: 10 ft.	Closed and covered. To West End Ditch.	To West Fnd Ditch.	No surficial evidence of contamination.
Landfill No. 4	9.	1956-Eerly 1970's	21	Garbage, base trash, industrial sludges, paints.	Trench & fill with burning. Depth: 8-10 ft.	Closed and covered.	To West Fnd Ditch.	No surficial evidence of contamination.
Landfill No. 5	4 .6	Estly 1970's- 1974	<u>ō</u>	Garbage, base trash, industrial sludges, paints.	Trench & fill Depth: 0 ft.	Closed and covered. To West End Ditch.	To West End Ditch,	No surificial evidence of contamination.
Landfill No. 6	9.	1974-Present	ž.	Garbage, base trash, industrial aludges, paints.	Trench & fill Depth: 5 ft.	Active site.	To West Fnd Ditch.	No surficial evidence of contamination.
HARDFILL AREAS								
Herdfill Ares No. 1	4.7	Farly 1940's- 1951	•	Hardfill, construction rubble, land-scape debris.	Area fill.	Closed and covered, To West End Ditch,	To West End Ditch.	No evidence of contami- nation.
Herdfill Area No. 2	8.	1951-Present	ĸ	Hardfill, construction rubble, land-scape debris.	Ares fill.	Active site.	To Alabama River.	No surficial evidence of contamination.
Hardfill Area No. 3	ž	1950-Present	0	Hardfill, landscape debris.	Area fill.	Active site.	Drainage ditchem to Alabama River.	No surficial evidence of contamination.
FLECTROPLATING WASTE DISPOSAL SITE	TE DISPOS	AL SITE						
Electroplating Waste Disposal Site	. .	Late 1940's- mid-1960's	3 to 5	Spent electroplating solutions.	Trench & fill Depth: 8-10 ft.	Closed and covered, To West Fnd Ditch.	To West Fnd Ditch,	No Burficial evidence of contamination.

From the mid-1970's to the present, household garbage and base trash from Gunter AFS has been collected and hauled to the active landfills at Maxwell AFB. Prior to the mid-1970's, garbage and trash were collected and taken to a nearby landfill for disposal. In the past, this landfill was located on leased land which was part of Gunter AFS, however, the leased property has been returned to the owner (City of Montgomery).

Landfill No. 1

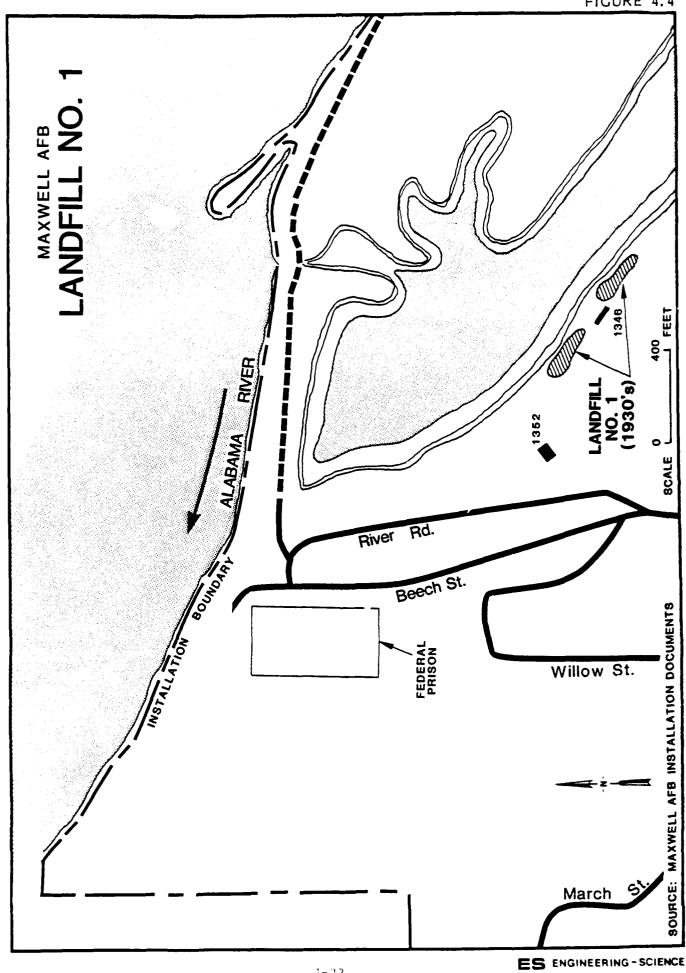
During the 1930's, base sanitary refuse was disposed of on an embankment behind the present horse stables and Building 1346 as shown in Figure 4.4. Landfill No. 1 was operated as an area fill whereby household garbage and base refuse (paper, scrap wood, scrap metal) were routinely pushed over the embankment, occasionally burned and then covered. Aerial photographs and ground observations made during the on-site visit indicate that dense vegetation has been established and that no visible evidence of contamination exists at this site. Due to the inert nature of the materials disposed of in this landfill, there is no reason to suspect that contamination problems exist at this site.

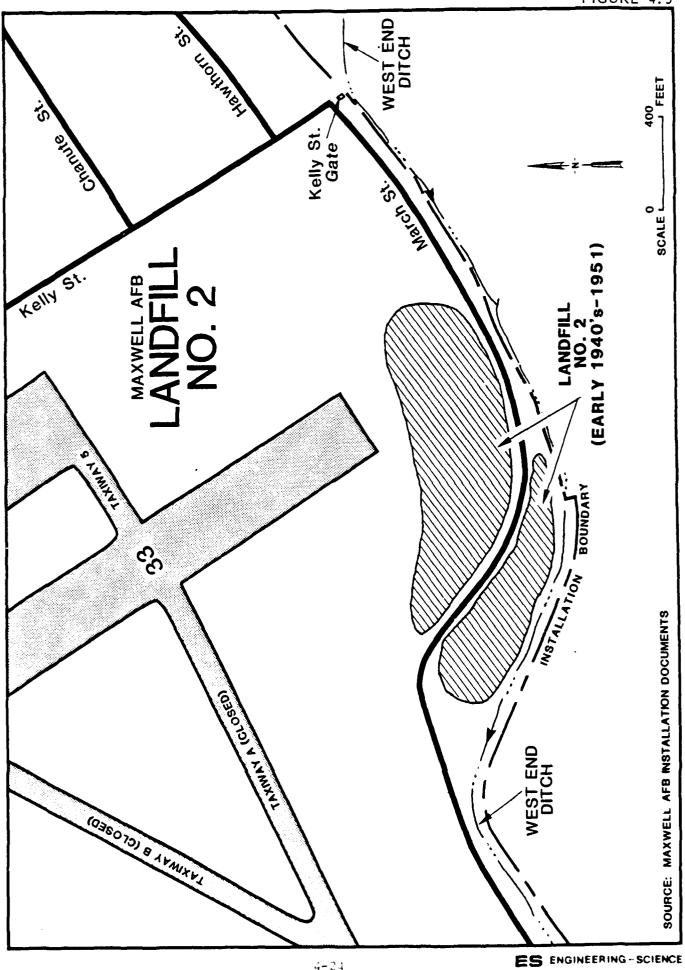
Landfill No. 2

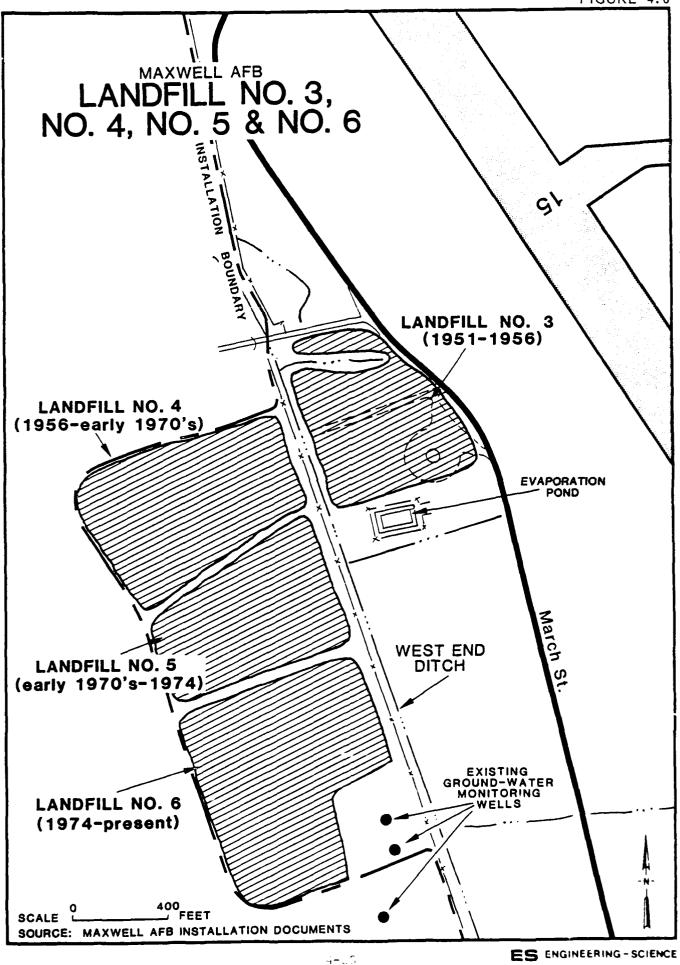
During the early 1940's through approximately 1951, the base operated Landfill No. 2 for the disposal of household garbage, base trash (paper, wood, scrap metal) and some industrial non-liquid wastes such as waste paints, paint cans, paint booth sludges and unrinsed pesticide containers (Figure 4.5). This landfill was a trench and fill operation with daily cover. The trenches were approximately 10 feet deep by 15 feet wide. The landfill encompasses about 20 acres and is presently closed and covered. The landfill is located in a floodplain near West End Ditch and the water table in the area is near the surface.

Landfill No. 3

Landfill No. 3 was located in the vicinity of the present fire protection training area as shown in Figure 4.6. Household garbage, base trash (paper, wood, scrap metal) and industrial non-liquids wastes such as waste paints, paint cans, paint booth sludges and unrinsed pesticide containers from the shops were disposed of in this landfill from 1951 to 1956. Trench and fill methods of operation were used over approximately 10 acres and trench dimensions averaged 10 feet deep by 15 feet wide. Daily cover was normally applied. The landfill area is







closed and has been covered. Landfill No. 3 is located in a floodplain near West End Ditch and the water table in the area is near the surface.

Landfill No. 4

Landfill No. 4 was located on land formerly leased to the Air Force adjacent to the base as shown in Figure 4.6. This landfill was operated from 1956 to the early 1970's using trench and fill techniques. Household garbage, base trash (paper, wood, scrap metal) and shop non-liquid wastes such as waste paints, paint cans, paint booth sludges, small quantities of solvent sludge and pesticide containers were disposed of in Landfill No. 4 and burning of the refuse was commonly used in the trenches prior to a daily soil covering. The landfill covered approximately 12 acres and the trench dimensions averaged 10 feet deep by 20 feet wide. Landfill No. 4 is closed and covered and vegetation has been established. This landfill is located in a floodplain near West End Ditch and the water table in the area is near the surface.

Landfill No. 5

Landfill No. 5 is a 10 acre area located on leased land south of Landfill No. 4 as shown on Figure 4.6. This landfill was operated from the early 1970's to 1974 for the disposal of household garbage, base trash (paper, wood, scrap metal) and some industrial non-liquid wastes such as waste paints, paint cans, paint booth sludges and pesticide containers. Landfill No. 5 was operated using trench and fill techniques with trench dimensions averaging eight feet deep by 20 feet wide. Burning of refuse was not a practice at this location and the site is presently closed and covered. This landfill is located in a floodplain near West End Ditch and the water table in the area is near the surface.

Landfill No. 6

Landfill No. 6 is a 15 acre leased site where disposal operations have been conducted from 1974 to the present as shown in Figure 4.6. Trench and fill methods are used to dispose of household garbage, base trash and some industrial non-liquid wastes such as waste paints, paint cans, paint booth sludges and pesticide containers. Trench dimension average approximately five feet deep by 20 feet wide. Daily soil cover is applied to the active disposal cell except during periods of wet weather. Approximately 10 acres of Landfill No. 6 are closed and covered while about five acres are currently active. This landfill

is located in a floodplain near West Fnd Ditch and the water table in the area is near the surface.

In 1981, three ground-water monitoring wells were installed at Landfill No. 6 and located as shown in Figure 4.6. The wells are between 21 and 23 feet deep and the depth to water in each well is between six and seven feet below grade. Fach well is monitored annually for pH, specific conductance, chlorides and iron.

The locations of the ground-water monitoring wells were established and specified by State of Alabama personnel. No observation wells were installed to determine ground-water flow directions and apparently no consideration was given to near-by past landfill areas in locating the monitoring wells. Also, the method of collecting the annual monitoring well samples does not include purging each well then allowing the well to recover prior to collecting a representative quantity of water. Therefore, the ground-water monitoring data available for this study may not be representative of the impact of Landfill No. 6 on the surrounding ground water and this data is not included in this report.

Hardfill Areas

Two hardfill areas on Maxwell AFB and one area on Gunter AFS have been identified. Descriptions of each area are listed below. The data for each hardfill area is summarized in Table 4.5.

Hardfill Area No. 1

Hardfill Area No. 1 was operated from the early 1940's through 1951. Area fill methods of disposal were used for construction rubble, land-scape debris and hardfill. Figure 4.7 illustrates the location of the eight acre area. A small northern portion of the landfill is still active for hardfill disposal; however, the remainder of the area is closed and covered. Due to the inert nature of the materials disposed of in this landfill, there is no reason to suspect that contamination problems exist at this location.

Hardfill Area No. 2

From 1951 to the present, Hardfill Area No. 2 receives landscape debris, construction rubble and, in the past, a small amount of household garbage. Fire Protection Training Area No. 1 was located within this hardfill area from the early 1940's to 1962. Hardfill Area No. 2 is an area fill type operation whereby low spots are filled, graded,

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then covered. Hardfill Area No. 2 encompasses approximately five acres as shown in Figure 4.8. A pond existed for many years in the center of this area. The pond has been filled in with construction debris. The landfill is presently active for disposal of landscape debris and construction rubble.

Hardfill Area No. 3

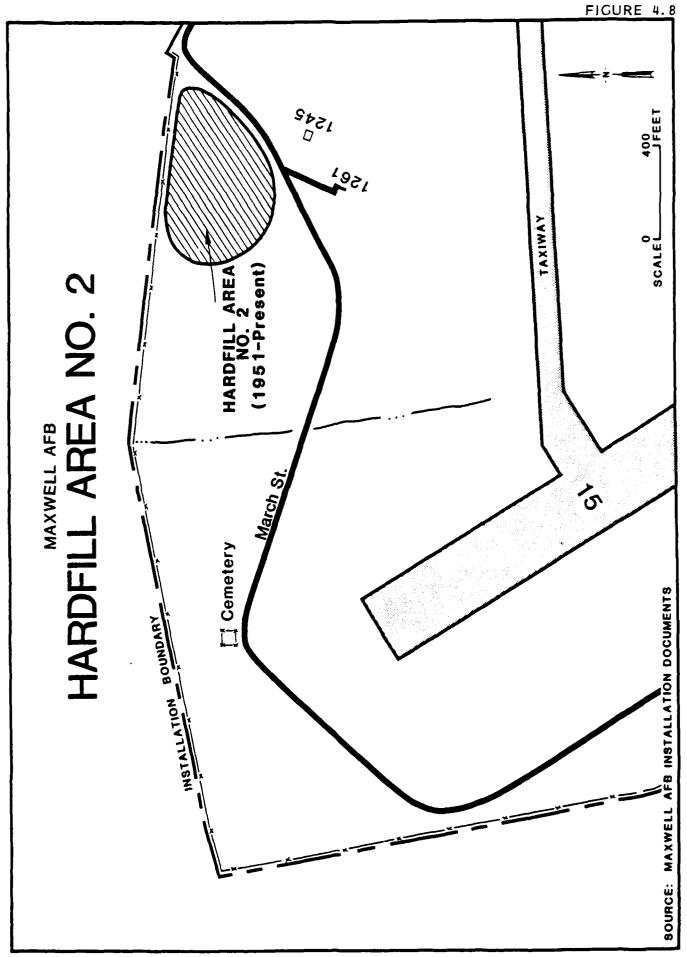
Hardfill Area No. 3 is utilized at Gunter AFS and has been in operation since the 1950's. The hardfill area is located in the east central portion of the facility and receives landscape debris, fill dirt and construction rubble. Occasionally, this hardfill area receives empty paint cans and rinsed pesticide containers. Due to the inert nature of the majority of materials disposed of in this landfill, there is insufficient reason to suspect that waste contamination or migration exists at this location.

Electroplating Waste Disposal Site

Electroplating operations were conducted at Maxwell AFP from the late 1940's through the early 1970's. From at least the late 1940's through the mid-1960's, spent electroplating solutions were drummed then disposed in an area near Hopper Lodge (Bldg. 1110) as shown in Figure 4.7. These solutions included copper, chromium, nickel, cadmium and cyanide compounds and approximately four to five drums of solutions were disposed per year during peak plating operation years from the mid-1950's to the early 1960's. It is estimated that approximately 20 to 40 drums of solutions have been disposed in this area. The data for this site is summarized in Table 4.5.

The method of disposal for this waste was trench and fill. The trenches were estimated to be eight to ten feet deep and approximately 14 feet wide. The area of disposal was reported to have clay soil and all of the area is covered and closed at the present. A parking lot covers at least a portion of the disposal area.

From the mid-1960's through the early 1970's, the electroplating solutions were regenerated which eliminated the need for on-site land disposal. The electroplating operations ceased in the early 1970's and the spent solutions were transported to Kelly AFP for disposal in the mid-1970's.



Sanitary Sewer System

Prior to 1967, sanitary wastes at Maxwell AFB were discharged at four outfalls to the Alabama River. In 1967, a wastewater treatment plant and collection system was completed to serve Maxwell AFP and a portion of the City of Montgomery. The treatment plant is located just outside the northern perimeter fence, about 400 feet from Facility 1250. Sanitary wastes from Gunter AFS have always been collected and sent to the City of Montgomery sewerage system.

As shown in Table 4.1, dilute industrial wastes have been discharged to the sanitary sewer system. These include NDI developers, electric shop battery acids and alcohol, aircraft cleaning solutions, aircraft surface preparation materials and pesticide container rinsewaters. No difficulties have been reported by wastewater treatment plant personnel in operating the sanitary treatment plant.

The plant provides secondary treatment (trickling filters) to the sewage and presently has an influent flowrate of 2.2 MGD. The flowrate when operations commenced in 1967 was 1.85 MGD. The total plant design capacity is 3.0 MGD.

Surface Drainage System

The surface drainage system at Maxwell AFB includes open drainage ditches which discharge to West End Ditch or to the Alabama River. The general drainage patterns on the base are shown in Figure 3.2. The West End Ditch empties into the Alabama River northwest of the base.

The surface drainage system on the north and west portions of Maxwell AFP received untreated industrial waste solutions from the 1940's through the early 1970's as noted in Table 4.6. These wastes included effluent from several washracks, rinse water from electroplating operations, unneutralized acids and quantities of paint stripper. An internal Air Force waste disposal survey (AF OFHL, 1969) was conducted in March 1969 to assess industrial waste disposal practices at Maxwell AFP. Oil/water separators were installed in the early 1970's for the separation of oily wastes. Also, the practice of neutralizing acid wastes prior to discharge to the surface drainage system began. Table 4.7 contains a listing and descriptions of the oil/water separators. The separators are cleaned by an off-base contractor on an as-needed basis.

TABLE 4.6

INDUSTRIAL WASTES DISCHARGED TO THE SURFACE DRAINAGE SYSTEM MAXWELL AFB

(1940's to Early 1970's)

Item	Disposal Quantity (gallons)	Disposal Interval
C.E. Paint Booth Wastewater	800	1 per 3 wks.
Washrack Wastewater	(1)	(1)
Calla 301 (Cleaning) Compound	(1)	(1)
PS-661/PD-680 Solvent	(1)	(1)
Washrack Paint Stripper	(1)	(1)
Electroplating Rinsewater	160	(1)
Dilute Hydrochloric Acid	20	2 per year
Dilute Nitric Acid	10	Yearly
Aircraft Paint Booth Wastewater and Sludges	4,000	Yearly
NDI Penetrant Oil	100	Yearly
NDI Emulsifier	55	Yearly
Radiator Shop Paint Stripper/Water	115	1 per 3 mos.
Streamrack Corrosion Removal Compound	500	1 per 3 mos.

Source: AF OEHL, 1969.

⁽¹⁾ Not specified in source.

TABLE 4.7 SUMMARY OF OIL/WATER SEPARATORS MAXWELL AFB AND GUNTER AFS

Bldg./Facility Number	Description	Size of Separator Skimmings Tank (gallons)
MAXWELL AFB		
936	General Vehicle Maintenance	1,000
1001	908 Flightline Maintenance	250
1025	Aircraft Washrack	700
1063	POL Vehicle Maintenance	1,000
1076	Auto Hobby Shop (1067)	1,000
1100	POL Tank Area	1,000
1104	POL Unloading Area	1,000
1352	C.E. Drum Storage Area	2,000
1143	Fire Protection Training Area No. 2	500
GUNTER AFS		
554	Motor Pool	280
715	Vehicle Maintenance	250

The surface drainage system on the east portion of Maxwell AFP receives surface drainage influent from portions of the City of Montgomery. This influent water and surface drainage from the base flow through the housing area then through a series of on-base lakes then to the Alabama River. As discussed in Section 3, a recently expanded monitoring program for the surface drainage influent has indicated elevated levels of arsenic and lead. Also, levels of phenols and oil and grease were detected in the influent stream. The source or sources of the off-base contaminants have not been identified.

The surface drainage patterns for Gunter AFS are shown in Figure 3.3. Open ditches which drain to Galbraith Mill Creek are utilized to transport the surface drainage off-base. In the past, limited amounts of pesticide rinsewater have been discharged to the surface drainage system at Gunter AFS. There are two oil/water separators presently at Gunter AFS also noted in Table 4.7.

Incinerators

Three incinerators are operated at Maxwell AFB, two of which are used infrequently for the destruction of documents and one for the disposal of medical wastes. The two document incinerators are located in Buildings 929 and 1344, respectively, and have been installed since the 1960's. The base hospital (Bldg. 50) operates an incinerator for the disposal of pathological wastes.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Maxwell AFP and Gunter AFS has resulted in the identification of 14 sites which were initially considered as areas of concern with regard to the potential for contamination, as well as the potential for the migration of contaminants. These sites were evaluated using the Decision Tree Methodology referred to in Figure 1.1. Those sites which were considered as not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurrence of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Mathodology (HARM). Table 4.8 identifies the decision tree logic used for each of the areas of initial concern.

TABLE 4.8

SUMMARY OF DECISION TREE LOGIC FOR AREAS
OF INITIAL ENVIRONMENTAL CONCERN AT MAXWELL AFB AND GUNTER AFS

Site Description	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environ- mental Concern	HARM Rating
Fire Protection Training Area No. 1	Yes	Yes	NA	Yes
Fire Protection Training Area No. 2	Yes	Yes	NA	Yes
C.E. Drum Storage Area	Yes	Yes	NA	Yes
Landfill No. 1	No	No	No	No
Landfill No. 2	Yes	Yes	NA	Yes
Landfill No. 3	Yes	Yes	NA	Yes
Landfill No. 4	Yes	Yes	NA	Yes
Landfill No. 5	Yes	Yes	NA	Yes
Landfill No. 6	Yes	Yes	NA	Yes
Hardfill Area No. 1	No	No	No	No
dardfill Area No. 2	Yes	Yes	NA	Yes
Hardfill Area No. 3	No	No	No	No
Electroplating Waste Disposal Site	Yes	Yes	NA	Yes
Surface Drainage System	Yes	Yes	NA	Yes

Based on the decision tree logic, three of the 14 sites originally reviewed did not warrant evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these three sites from HARM evaluation is discussed below.

Landfill No. 1 received household garbage and base refuse during the 1930's prior to the periods of major industrial shop activity on Maxwell AFB. Visual inspection of the site indicated that dense vegetation was established and that the site does not appear to have a potential for contamination.

Hardfill Area No. 1 and the Hardfill Area No. 3 received construction rubble, landscape debris and fill dirt. These materials are typically inert and are considered unlikely to cause any contamination of surface or ground water.

The remaining 11 sites identified on Table 4.9 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. The details of the rating procedures are presented in Appendix G. Results of the assessment for the sites are summarized in Table 4.9. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.9 is intended to assigning priorities for further evaluation of the Maxwell AFB disposal areas (Chapter 5, Conclusions and Chapter 6, Recommendations). The rating forms for the individual waste disposal sites at Maxwell AFB are presented in Appendix H. Photographs of some of the disposal sites are included in Appendix F.

TABLE 4.9
SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES
MAXWELL AFB

ž	Site Name and No.	Receptor	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
<u>:</u>	i. Blectroplating Waste Disposal Site	20	80	98	1.00	12
2.	Surface Drainage System	52	06	84	0.95	12
3.	Fire Protection Training Area No. 2	46	64	16	0.95	65
.	Fire Protection Training Area No. 1	. 7	64	19	1.00	58
٠,	Landfill No. 4	51	24	88	1.00	54
·	C.E. Dru Storage Area	45	54	69	0.95	53
٦.	Landfill No. 5	51	24	18	1.00	52
	Landfill No. 6	15	24	81	1.00	52
•	Landfill No. 2	4	24	88	1.00	15
•	Landfill No. 3	48	24	18	1.00	51
<u>.</u>	Hardfill Area No. 2	46	20	19	1.00	44

INSTALLATION RESTORATION PROGRAM PHASE 1: RECORDS -SEARCH MAXMELL AIR FORCE BASE ALABAMA(U) ENGINEERING-SCIENCE INC ATLANTA GA JAN 84 NO-1227 041 2/3 F/G 24/7 UNCLASSIFIED NL

SECTION 5 CONCLUSIONS

The objective of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on field inspections, review of records and files, review of the environmental setting, and interviews with base personnel, past employees, and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at Maxwell AFB and a summary of the HARM scores for those sites.

ELECTROPLATING WASTE DISPOSAL SITE

The electroplating waste disposal site has a sufficient potential to create environmental contamination and follow-on investigation is warranted. From the late 1940's through the mid-1960's, spent electroplating solutions were drummed then disposed of on Maxwell AFB near Hopper Lodge (Bldg. 1110). These solutions contained copper, chromium, nickel, cadmium and cyanide components commonly used in electroplating processes. It is estimated that a total of 20 to 40 drums of plating solutions have been disposed of by trench and fill methods at this site. Due to the nature of the wastes (persistent metals), the depth of the trenches (eight to 10 feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 72.

SURFACE DRAINAGE SYSTEM

The surface drainage system has a sufficient potential to create environmental contamination and follow-on investigation is warranted. From the 1940's through the early 1970's, the surface drainage system on the west and north portion of Maxwell AFB received considerable

TABLE 5.1 SITES ASSESSED USING THE HAZARD ASSESSMENT RATING METHODOLOGY

MAXWELL AFB

Rank	Site Name and Number	Occurrence	Final Score
1	Electroplating Waste Disposal Site	Late 1940's to Mid 1960's	72
2	Surface Drainage System	1940's to Early 1970's	72
3	Fire Protection Training Area No. 2	1962 to Present	59
4	Fire Protection Training Area No. 1	1940's to 1962	58
5	Landfill No. 4	1956 to Early 1970's	54
6	C. E. Drum Storage Area	Mid-1970's to Present	53
7	Landfill No. 5	Early 1970's to 1974	52
8	Landfill No. 6	1974 to Present	52
9	Landfill No. 2	Early 1940's to 1951	51
10	Landfill No. 3	1951-1956	51
11	Hardfill Area No. 2	1951-Present	44

quantities of industrial waste solutions including paint booth wastewater, paint strippers, electroplating rinse water, penetrant oil, dilute acids, dilute caustics and steamrack corrosion removal compound. Since the early 1970's most hazardous waste solutions have been drummed for disposal by an off-base contractor. Oil/water separators have been installed throughout the base for the separation of oily wastes. The surface drainage system on the east portion of Maxwell AFB receives contaminants including arsenic and lead from an unidentified off-base source(s). Due to the nature of the wastes described above and listed in Table 4.6, the soil permeability in the shallow aquifer and the probable direct connection between the shallow and deeper aquifers, the surface drainage system received a HARM score of 72.

FIRE PROTECTION TRAINING AREA NO. 2

Fire Protection Training Area No. 2 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Fire Protection Training Area No. 2 has been operated from 1962 to the present. For the period 1962 through approximately 1973, waste oils, waste fuels, waste solvents and other ignitable wastes from the shop areas were used for the training exercises. Drums of these materials were delivered to a holding area just north of the fire pit then consumed as needed. Between 25 and 35 drums would accumulate at one time at this location. Moderate leakage from these drums was believed to have occurred. Occasionally during the period 1962 through 1978, water and residual waste ignitable materials would overflow from the pit area to West End Ditch. In 1978, a concrete liner, collection sump, oil/water separator and an evaporation pond were constructed in the fire pit area. Due to the nature of the wastes consumed (straight chain hydrocarbons), the soil permeability and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 59.

FIRE PROTECTION TRAINING AREA NO. 1

Fire Protection Training Area No. 1 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Fire Protection Training Area No. 1 was operated from the early 1940's to approximately 1962. Waste oils, waste fuels, waste solvents and other ignitable wastes from the shop area were stored on an embankment near the area of the fire pit for use in each exercise. Between 10 and 20 drums would be stored at one time. Occasionally, the waste fuels and solvent would overflow out of the pit area during an exercise into a small pond which existed nearby. The pit area and pond have been filled in and covered over with several feet of soil, land-scape debris and construction rubble. Due to the nature of the wastes (straight chain hydrocarbons) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 58.

LANDFILL NO. 4

Landfill No. 4 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 4 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers and small quantities of solvent sludge) during its period of operation, 1956 to the early 1970's. Trench and fill methods were used with frequent burning of the trash prior to the application of daily soil cover. Landfill No. 4 is presently closed and a vegetative cover has been established. Due to its location in a floodplain near West End Ditch, the depth of the trenches (10 feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 54.

C.E. DRUM STORAGE AREA

The C.E. drum storage area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Between 80 and 90 drums of waste paints and non-ignitable oil/water mixtures have been stored at this site. Since the late 1970's, drums at the C.E. storage area have been placed on a concrete pad which drains to an oil/water separator. Prior to the late 1970's, drums were stored on the ground. There was indications that some leakage had occurred. Due to the nature of the wastes stored (substituted and other ring compounds), the soil permeability and the probable direct connection

between the shallow and deeper aquifers, this site received a HARM score of 53.

LANDFILL NO. 5

Landfill No. 5 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 5 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers) during its period of operation, early 1970's to 1974. Trench and fill methods were used, however, the trash was not burned prior to the application of daily soil cover. Landfill No. 5 is presently closed and covered. Due to its location in a floodplain near West End Ditch, the depth of the trenches (eight feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 52.

LANDFILL NO. 6

Landfill No. 6 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 6 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers) during its period of operation, 1974 to the present. Trench and fill methods were used. Burning of the trash prior to the application of daily soil cover has not been practiced. Landfill No. 6 is presently an active landfill operation. Due to its location in a floodplain near West End Ditch, the depth of the trenches (five feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers this site received a HARM score of 52.

LANDFILL NO. 2

Landfill No. 2 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 2 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers) during its period of operation, early 1940's to 1951. Trench and fill methods were used and there was no burning of the trash prior to the application of

daily soil cover. Landfill No. 2 is presently closed and covered. Due to its location in a floodplain near West End Ditch, the depth of the trenches (10 feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 51.

LANDFILL NO. 3

Landfill No. 3 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 3 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers) during its period of operation, 1951 to 1956. Trench and fill methods were used and there was no burning of the trash prior to the application of the soil cover. Landfill No. 3 is presently closed and covered. Due to its location in a floodplain near West End Ditch, the depth of the trenches (10 feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shailow and deeper aquifers, this site received a HARM score of 51.

HARDFILL AREA NO. 2

Hardfill area No. 2 has an insufficient potential for environmental contamination and follow-on investigation is not warranted. This site was considered due to its proximity to Fire Protection Training Area No.

1. This site received a HARM Score of 44.

SECTION 6

RECOMMENDATIONS

identified as Eleven sites were having the potential These sites have been evaluated using the environmental contamination. HARM system which assesses their relative potential for contamination. Ten of the sites were determined to have sufficient evidence to indicate potential for environmental contamination. Additional data concerning these sites will be required in order to clearly ascertain whether or these sites have contributed environmental contamination. Therefore, the following recommendations have been developed for each of There was insufficient evidence at one site to warrant further investigation.

PHASE II MONITORING RECOMMENDATIONS

The following recommendations are made to further assess the potential for environmental contamination from waste disposal areas at Maxwell AFB. The recommended actions are a one-time sampling programs to determine if contamination does exist at the site. If contamination is confirmed, the sampling program may need to be expanded to further quantify the extent of contamination. The recommended monitoring program for Phase II is summarized in Table 6.1.

Due to the lack of ground-water flow direction information available for the Phase I Records Search, individual determinations of ground-water flow should be made to aid in the proper placement of ground-water monitoring wells for each identified site. These determinations should be made by installing observation wells in and around

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II
MAXWELL AFB

	Site Mame	Rating Score	Recommended Monitoring	Comments
<u>.</u> ا	Blectroplating Waste Disposal Site	21	a. Conduct a geophysical survey using electro- magnetic and/or magnetometer techniques to confirm the location of the drums of plating solution wastes and to aid in the proper locations for monitoring wells.	ė
			b. Install one upgradient and two downgradient ground-water monitoring wells. Wells should be constructed of corrosion and acressed blow the top of the water table between 10 and 20 feet deep. Wells should be sampled and analyzed for the parameters in List A, Table 6.2.	Continue monitoring if sampling confirms metals or cyanide contamination. Additional monitoring walls may be necessary to assess extent of contamination.
. .	Surface Drainage System	22	a. Collect series of stream sediment samples at locations in West End Ditch, the drainage ditch in the north central portion of the base and the drainage ditch in the housing area. Analysis should be performed on the samples for the parameters in List B, Table 6.2.	Establish additional sampling stations if contamination is found to quantify the extent of contamination.
			b. Expand the surface water quality monitor- ing program to include four additional sampling points in West End Ditch. Water samples should be analyzed for the be analyzed for the parameters in List B, Table 6.2.	Establish additional sampling stations if contamina- tion is found to quantify the extent of contamination.
			o. Expand the surface water quality monitor- ing program for all existing sampling points on Maxwell AFB to include analyses for the parameters in List B, Table 6.2.	Establish additional sampling stations if contamination is found to quantify the extent of contamination.

TABLE 6.1
RECOMMENDED MONITORING PROGRM FOR PHASE II
MAXWELL AFB
(Continued)

	Site Name	Rating Score	Recommended Monitoring	Comments
. 	Fire Protection Training Area No. 2 and Landfill No. 3	59 and 51, respectively	a. Conduct a geophysical survey consist- ing of electrical resistivity, elec- tromagnetic and/or magnetometer techniques to delineate the extent cf the site. b. Install one upgradient and two down- gradient ground-water monitoring vells. Wells should be constructed of Schedule 40 PVC and acteened below the top of the water table between 10 and 20 feet. Wells should be analyzed for parameters in List C. Table 6.2.	Continue monitoring if sampling confirms contamination. GC/MS Scan may be run to identify organic contaminants found. Additional wells may be necessary to quantify extent of the contamination.
÷	Fire Protection Training Area No. 1	85	Install one upgradient and two downgradient ground-water monitoring walls. Wells should be constructed of Schodule 40 PVC and screened into the water table (five to 20 feet). Wells should be analyzed for the parameters in List C, Table 6.2.	Continue monitoring if sampling confirms containation. Additional wells may be necessary to quantify extent of contamination.
ń	Landfill No. 4, No. 5 and No. 6	54, 52 and 52, respectively	a. Conduct a geophysical survey consist- ing of electrical resistivity, elec- tromagnetic and/or magnetometer techniques to delineate the extent of the site. b. Install one upgradient and three downgradient ground-water monitor- ing wells. Wells should be con- structed of Schedula 40 PVC and screened below the top of the water table between 10 and 20 feet, Wells should be analyzed for the parame- ters in List C, Table 6.2.	Continue monitoring if sampling confirms contamination. GC/MS Scan may be run to identify organic contaminants found, Additional walls may be necessary to quantify extent of contamination.
ė	C. E. Drum Storage Area	æ	Install one upgradient and two down-gradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC and screened into the water table (5 to 30 feet). Wells should be analyzed for parameters in List C, Table 6.2.	Continue monitoring if sampling confirms contamination. GC/MS Sem may be run to identify organic contaminants found. Additional wells may be necessary to to quantify extent of the contamination.

TABLE 6.1
RECOMMENDED MONITORING PROGRM FOR PHASE II
MAXWELL AFB
(Continued)

Site Name	Rating Score	Recommended Monitoring	Comments
7. Landfill No. 2	īs.	a. Conduct a geophysical survey consist- ing of electrical resistivity, elec- troasgnetic and/or magnetometer techniques to delineate the extent of of the site.	Continue monitoring if sampling confirms contamination. Additional wells may be necessary to quantify extent of contamination.
		b. Install one upgradient and two downgradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC and screened into the water table between five and 20 feet. Wells should be analyzed for the parameters in List C, Table 6.2.	

each identified site in order to determine ground-water elevations and elevation changes. The Phase II contractor may choose to install the observation wells in accordance with specifications for ground-water monitoring wells for future use in the ground-water monitoring program recommended below.

Electroplating Waste Disposal Site

The locations of the drums containing the plating solution wastes should be confirmed by conducting a geophysical survey using electromagnetic and/or magnetometer techniques. Following completion of this survey, a ground-water monitoring system should be established to characterize the ground-water quality and identify any migration of contaminants. One upgradient and two downgradient ground-water monitoring wells should be installed. The wells should be constructed of corrosion resistant materials able to withstand low pH and cyanide wastes and screened below the water table between 10 and 20 feet. Samples collected from these wells should be analyzed for the parameters in List A, Table 6.2.

Surface Drainage System

Stream sediment samples should be collected at nine locations in West End Ditch, at three locations in the drainage ditch in the north central portion of the base and at one location in the drainage ditch in the housing area as shown in Figure 6.1. Each sediment sample should be taken at a depth of between six and twelve inches. Analyses should be performed for the parameters in List B, Table 6.2.

The surface water quality monitoring program should be expanded for a period of six months to include four additional sampling points in West End Ditch as shown in Figure 6.2. Sampling point A is recommended in order to assess the total contaminant levels entering the base, if any. Sampling points B, C and D are recommended in order to monitor potential migration of contaminants to West End Ditch from Landfill No. 2, the electroplating waste disposal site and Landfill No. 3, No. 4, No. 5 and No. 6. Water samples should be analyzed for the parameters in

TABLE 6.2 RECOMMENDED LIST OF ANALYTICAL PARAMETERS MAXWELL AFB

L	í	s	t	Α

Copper Cyanide

Nickel pH Total dissolved solids

Chromium Zinc Total organic carbon Phenols

List B

Copper Cyanide

Nickel pH Cadium Total dissolved solids

Chromium Zinc
Total organic carbon Phenols

Total organic carbon Phenols

Lead Oil and grease Arsenic

Total organic halogens

Mercury

List C

Total organic halogens Oil and grease

Total organic carbon Nickel
Phenols Cyanide
pH Sulfate

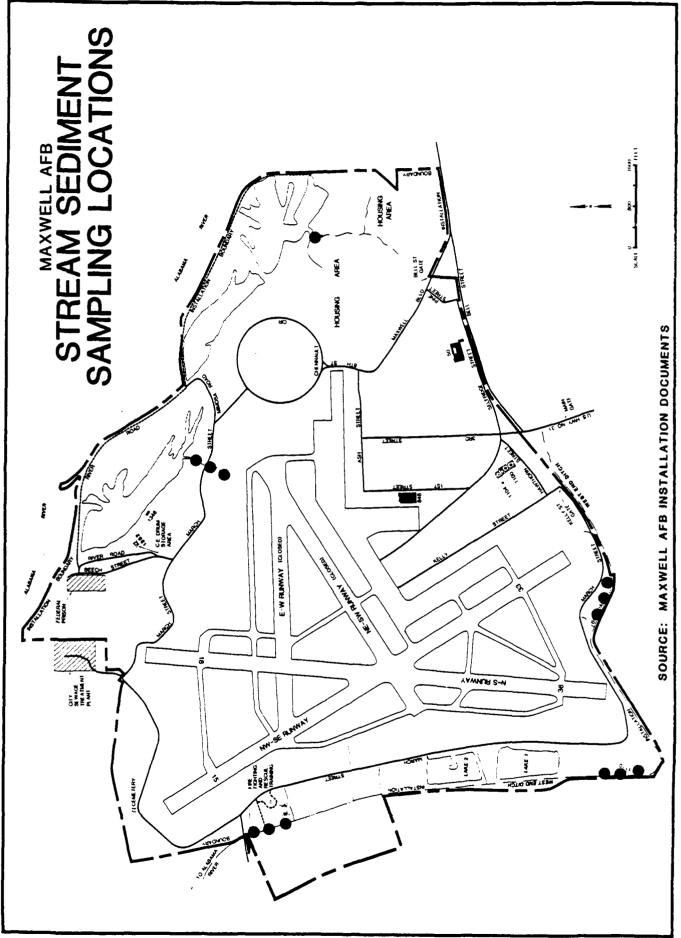
pH Sulfate
Copper Total dissolved solids

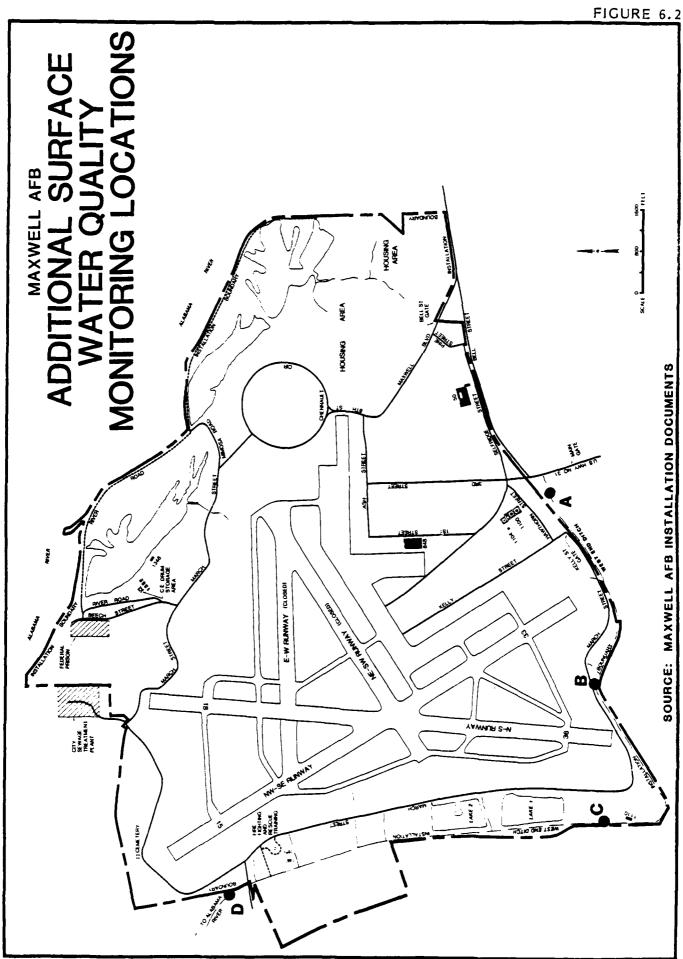
Iron Zinc

Interim Primary Drinking Water Standards (selected list)

Arsenic Lead Endrin 2,4,5-TP
Barium Mercury Lindane
Cadium Nitrate Methoxychlor

Chromium Selenium Toxaphene Fluoride Silver 2,4-D





List B, Table 6.2. Also, the parameters for all existing surface water quality sampling locations should be expanded to include analyses for the items in List B, Table 6.2.

Fire Protection Training Area No. 2 and Landfill No. 3

A geophysical survey, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, is recommended prior to the well installations to attempt to delineate the horizontal and vertical extent of the site as well as any subsurface leachate plumes migrating from the site. After completion of this study, one upgradient and two downgradient ground-water monitoring wells should be installed. The wells should be constructed of Schedule 40 PVC and screened below the top of the water table between 10 and 20 feet. Samples from each well should be analyzed for the parameters in List C, Table 6.2.

Fire Protection Training Area No. 1

One upgradient and two downgradient ground-water monitoring wells should be installed. The wells should be screened into the top of the water table (five to 20 feet). The wells should be constructed of Schedule 40 PVC pipe. Samples from each well should be analyzed for the parameters in List C, Table 6.2.

Landfill No. 4, No. 5 and No. 6

A geophysical survey, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, is recommended prior to the well installations to attempt to delineate the horizontal and vertical extent of the site as well as any subsurface leachate plumes migrating from the site. After completion of this study, one upgradient and three downgradient groundwater monitoring wells should be installed. Wells should be constructed of Schedule 40 PVC and screened below the top of the water table between 10 and 20 feet. Samples should be collected from the three existing wells and the four new wells and analyzed for the parameters in List C, Table 6.2.

C. E. Drum Storage Area

One upgradient and two downgradient ground-water monitoring wells should be installed. Wells should be constructed of Schedule 40 PVC and screened into the water table (five to 30 feet). Samples from each well should be analyzed for the parameters in List C, Table 6.2.

Landfill No. 2

A geophysical survey, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, is recommended prior to the well installations to attempt to delineate the horizontal and vertical extent of the site as well as any subsurface leachate plumes migrating from the site. After completion of this study, one upgradient and two downgradient ground-water monitoring wells should be installed. The wells should be constructed of Schedule 40 PVC and screened below the water table 10 to 20 feet. Samples from each well should be analyzed for the parameters in List C, Table 6.2.

RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the identified disposal sites for the following reasons: (1) to provide the continued protection of human health, welfare, and the environment; (2) to insure that the migration of potential contaminants is not promoted through improper land uses; (3) to facilitate the compatible development of future USAF facilities; and (4) to allow for identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each of the identified disposal sites at Maxwell AFB are presented in Table 6.3. A description of the land use restriction guidelines is presented in Table 6.4. Land use restrictions at sites recommended for Phase II monitoring should be reevaluated upon the completion of the Phase II monitoring program and changes made where appropriate.

RECOMMENDED GUIDELINES FOR FUTURE LAND USE RESTRICTIONS AT POTENTIAL CONTAMINATION SITES TABLE 6.3

Recommended Guidelines for Puture Land Use Restrictions

Housing on or near the site	æ	¥.	¥	¥z	¥.	X A	NA NA
	¥ Z	e v	e v	~	e V	æ	V.
Vehicular traffic Material storage	NR.	N.	X X	AN A	¥	¥.	X.
Disposal operations	e c	æ	~	æ	α	œ	er.
zonzce	NA NA	ź	α	æ	¥	œ	V Z
Recreational use Burning or ignition	R.	œ	œ	æ	¥.	£	Æ
Water infiltration (Run-on, ponding, irrigation)	œ	ž	£	YY.	œ	œ	œ
Silvicultural use	Œ.	æ	Œ	œ	¥	\$	£
Agricultural use	¥	«	Œ	α	Z.	ź	¥
Well construction on or near the site	æ	œ	Œ	œ	ĸ	æ	æ
Excavation	œ	ž	œ	œ	œ	\$	œ
Construction on the site	· ac	ž	ž	ş	α	ź	œ
Site Name	Electroplating Maste Disposal Site	Storm Sever System	Fire Protection Training Area No. 2 and Landfill No. 3	Fire Protection Training Area No. 1	Landfill No. 4, 5, & 6	C. E. Drum Storage Area	Landfill No. 2

See Table 6.4 for definition of land use restrictions.

= Not Applicable

= Restriction

± No Restriction

≖ Present Use

α ¥ ± ¥

TABLE 6.4
DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for agricul- tural purposes to prevent food chain con- tamination.
Silvicultural use	Restrict the use of the site for silvicul- tural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irri- gation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicu- lar traffic on the site due to the presence of explosive material(s) and/or of an un- stable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

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APPENDIX A

PROJECT TEAM BIOGRAPHICAL DATA

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Biographical Data

RANDAL M. REYNOLDS

Senior Engineer



Education

BChE (Chemical Engineering), 1973, Georgia Institute of Technology, Atlanta, Georgia

Professional Affiliations

Registered Professional Engineer, Georgia #13023
Air Pollution Control Association
American Institute of Chemical Engineers (Local Section Chairman, 1982-1983

Experience Record

1973-1975 U.S. Environmental Protection Agency, Water Enforcement Branch, Atlanta, Georgia. Chemical Engineer. Responsible for developing draft NPDES limitations for industrial discharges, issuing public notices and final NPDES permits and participating in public hearings concerning NPDES permits.

1975-1981 Gold Kist Inc., Corporate Engineering, Atlanta, Georgia.
Environmental Process Engineer. Responsible for reviewing and implementing new air quality, NPDES, RCRA and TSCA regulations. Supervised preparation and submittal of air quality, water quality and hazardous waste permit applications. Kept management informed of impact of regulations on existing and future projects.

Served as staff engineer responsible for preparing preliminary designs for air pollution control systems and detailed cost estimates for air system capital projects. Major projects included the preliminary selection of alternatives for a particulate emission control system for a 60,000 lbs/hr industrial steam boiler (peanut hull/wood fired).

1981-Date Engineering-Science, Inc., Atlanta, Georgia. Senior Engineer. Responsible for developing environmental studies and alternative evaluations for clients in the areas of solid/hazardous waste management, spill control and containment and process/energy system design.

Randal M. Reynolds (Continued)

Lead Project Engineer for a U.S. Department of Energy project concerning the disposal of coal wastes from industrial facilities using RCRA nonhazardous and hazardous design conditions. Performed 19 industrial plant site visits to obtain specific coal ash handling and disposal costs. Coordinated the preparation of 20 plant reports describing the individual cost estimates to comply with RCRA regulations.

Project Manager for an evaluation of laboratory waste solvent generation from an industrial facility. Worked with client's lab personnel to accurately determine waste types and quantities. Established lab procedures to segregate waste solvents for contractor disposal.

Project Manager for a Phase I Installation Restoration Program (IRP) project for the Department of Defense. Conducted interviews of past and present employees, examined records, and performed site investigations to determine hazardous chemical usage, waste generation and waste disposal practices for industrial operations at this Air Force base.

Through environmental audit procedures, identified industrial operation disposal practices which could result in waste migration and recommended priority disposal practices requiring further investigation. Project Engineer for Phase I IRP projects for 10 other Air Force bases.

Project Engineer assisting in a comprehensive study of the solid waste management program for the City of Roswell, Georgia. Developed conceptual cost estimates for a city operated sanitary landfill and incinerator disposal alternatives.

Project Manager for development of a Spill Prevention Control and Countermeasures (SPCC) Plan for an industrial facility. Coordinated the design of spill containment structures and recommended essential spill control and clean-up equipment.

Publications and Presentations

R. M. Reynolds, C. M. Mangan and B. D. Moreth, "Projected RCRA Disposal Costs for Ash and Related Wastes from Coal-Fired Industrial Facilities," presented at the 76th Annual Meeting of the Air Pollution Control Association, Atlanta, Georgia, June 20, 1983.

ES ENGINEERING-SCIENCE

Randal M. Reynolds (Continued)

- R. M. Reynolds, "Practical Tips Bagging Sludge?", <u>Pollution</u> <u>Engineering</u>, Vol. 12, No. 17, July 1980, pg. 28.
- R. M. Reynolds, "Pulse-Type Fabric Filters in a Soybean Processing Facility," Operation and Maintenance of Air Particulate Control Equipment, R. A. Young, F. L. Cross, Jr., editors, Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, July 1980, pp. 121-123.

"Operation, Maintenance and Design of Fabric Filters for a Soybean Processing Facility," a slide presentation for an EPA technology transfer seminar, "Operation and Maintenance of Air Pollution Equipment for Particulate Control," April 12, 1979, Atlanta, Georgia.

Biographical Data

JOHN R. ABSALON Hydrogeologist

Education

B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations

Certified Professional Geologist (Indiana No. 46)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors,
Seymour, Connecticut. Geologist. Responsible for
the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the
New England area. Also managed the office staff,

drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs,
New Jersey. Engineering Geologist. Responsible for
planning and management of geotechnical investigations
in the northeastern U.S. and Illinois. Other duties
included formal report preparation.

1975-1978

U.S. Army Environmental Hygiene Agency, Fort Mc-Pherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia.
Engineering Geologist/Hydrogeologist. Responsible
for the project supervision of waste management, water
quality assessment, geotechnical, and hydrogeologic
studies at commercial, industrial, and government

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John R. Absalon (Continued)

facilities. General experience included planning and management of several ground-water monitoring programs, development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at an Air Force installation in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date

Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at twelve Air Force bases and other industrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida. Conducted quality management, hydrogeologic and ground-water quality programs for the pulp and paper industry at several mills located in the Southeast United States.

Publications and Presentations

"An Investigation of the Brunswick Formation at Roseland, NJ," 1973, with others, The Bulletin, Vol 18, No. 1, NJ Academy of Science, Trenton, NJ.

"Engineering Geology of Fort Bliss, Texas," 1978, coauthor: R. Barksdale, in <u>Terrain Analysis of Fort Bliss, Texas</u>, US Army Topographic Laboratory, Fort Belvoir, VA.

"Geologic Aspects of Waste Disposal Site Evaluations," 1980, with others, Program and Abstracts AEG-ASCE Symposium on Hazardous Waste Disposal, April 26, Raleigh, NC.

"Practical Aspects of Ground-Water Monitoring at Existing Disposal Sites," 1980, coauthor: R.C. Starr, <u>Proceedings</u> of the EPA National Conference on Management of Uncontrolled Hazarlous Sites, HMCRI, Silver Spring, MD.

"Improving the Reliability of Ground-Water Monitoring Systems," 1981, Proceedings of the Madison Conference of Applied Research and Practice on Municipal and Industrial Waste, University of Wisconsin-Extension, Madison, WI.

10.22

John R. Absalon (Continued)

Ground-Water Monitoring Workshop, 1982. Presented to Mississippi Bureau of Pollution Control, Jackson, 15-17 February.

Ground-Water Monitoring Workshop, 1982. Presented to Alabama Division of Solid and Hazardous Waste, Huntsville, 20-21 July.

Ground-Water Monitoring Workshop, 1982. Presented to Kentucky Waste Management Division, Bowling Green, 27-28 July.

"Identification and Treatment Alternatives Evaluation for Contaminated Ground Water," 1982, coauthor: M. R. Hockenbury. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Preliminary Assessment of Past Waste Storage and Disposal Sites," 1982, coauthor: W. G. Christopher. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Treatment Alternatives Evaluation for Aquifer Restoration," 1983, coauthor: M. R. Hockenbury, <u>Proceedings</u> of the Third National Symposium on Aquifer Restoration and Ground Water Monitoring, NWWA, Worthington, OH.

Biographical Data

ROBERT L. THOEM Civil/Environmental Engineer



Education

B.S. Civil Engineering, 1962, Iowa State University, Ames, IAM.S. Sanitary Engineering, 1967, Rutgers University, New Brunswick, NJ

Professional Affiliations

Registered Professional Engineer (Alabama No. 10580, Georgia No. 10391, Iowa No. 5802, Illinois No. 62-32684, South Carolina No. 9178 and Virginia No. 13461)

American Academy of Environmental Engineering (Diplomate)

American Society of Civil Engineers (Fellow)

National Society of Professional Engineers (Member)

Water Pollution Control Federation (Member)

Honorary Affiliations

Who's Who in Engineering Who's Who in the Midwest USPHS Traineeship

Experience Record

1962-1965 U.S. Public Health Service, New York, NY. Staff
Engineer, Construction Grants Section (1962-1964).
Technical and administrative management of grants for
municipal wastewater facilities in New York,
Pennsylvania, New Jersey and Delaware.

Water Resources Section Chief (1964-1965). Supervised preparation of regional water supply and pollution control reports.

1966-1983 Stanley Consultants, Muscatine, IA and Atlanta, GA.

Project Manager and Project Engineer (1966-1973).

Responsible for managing studies and preparing reports for a variety of industrial and governmental environmental projects.

Environmental Engineering Department Head (1973-1976). Supervised staff involved in auditing environmental practices, conducting studies and preparing reports concerning water and wastewater systems, solid waste

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and resource recovery and water resources projects (industrial and governmental).

Resource Management Department Head (1976-1982). Responsible for multidiscipline staff engaged in planning and design of water and wastewater systems, solid waste and resource recovery, water resources, bridge, site development and recreational projects (industrial, domestic and foreign governments).

Associate Chief Environmental Engineer (1980-1983). Corporate-wide quality assurance responsibilities on environmental engineering planning projects.

Operations Group Head and Branch Office Manager (1982-1983). Directed multidiscipline staff responsible for planning and design of steam generation, utilities, bridge, water and wastewater systems, solid waste and resource recovery, water resources, site development and recreational projects (industrial, domestic and foreign governments). Administered branch office support activities.

Project Manager/Engineer for over 25 industrial projects including iron and steel, industrial coke, distillery, tannery, poultry, meat, automotive, forging, plating, paper, plastic and aluminum operations. Responsibilities included studies, environmental audits, reports and preliminary designs for service water systems, wastewater treatment and pretreatment, oil removal, recirculation and cooling (water/wastewater/recirculation flows to 47,000 gpm at one plant), boiler feedwater treatment, storm drainage, residual waste disposal (to 1,000 tons per day) and/or solid waste disposal with energy recovery (to 45 tons per day).

Project Manager for over 25 city and county projects ranging in present study area population from 1,400 to 1,700,000. Investigations included water supply and treatment; water storage, pumping and distribution using computer modeling; wastewater collection and treatment (201 studies for plants to 120 mgd); sludge processing and disposal; storm drainage; and/or solid waste collection, disposal and resource recovery systems (to 4500 tons per day for one county).

Project Manager for over 10 regional (multi-county) planning or operating agency projects. Projects included comprehensive evaluation of sludge thickening, conditioning, stabilization, dewatering, incineration, thermal treatment, drying, fertilizer production, land-spreading and landfill (at a 290 mgd metro plant with 460 tons dry solids per day); solid waste collection, resource recovery, and disposal; water and sewer master

plans; and 208 areawide plans for major metropolitan regions covering point source wastewater management, nonpoint source controls, water quality management, and institutional/financial arrangements.

Project Manager for five state agency projects concerning water quality management, waste load allocations (303e and 208 programs), statewide sewage sludge disposal guidelines, and/or statewide solid waste resource recovery options. Also served three state universities on water distribution system, refuse incineration with energy recovery and steam plant planning projects.

Project Manager/Engineer on over 10 projects for federal agencies. Studies included wastewater management for several major urban areas; leather tanning and finishing industry wastewater effluent guidelines; wastewater and water planning, design and operation manuals; solid waste collection and disposal; flood control and statewide river navigability.

Project Manager on several projects for Middle East governments including design of a 48-inch diameter high-pressure water transmission line and an environmental assessment of a \$1.7 billion wastewater system improvement program serving a metropolitan area of over nine million people.

1983-Date Engineering-Science. Senior Project Manager. Responsible for managing a variety of environmental projects. Conducted two hazardous waste audits at U.S. Air Force bases to identify the potential migration of contaminants resulting from past disposal practices under the Phase I Installation Restoration Program. Evaluated solid waste collection, disposal and potential for resource recovery at a U.S. Army post. Performed cost allocation study for purposes of determining financial responsibilities among major users of a wastewater treatment plant.

<u>Publications</u> and Presentations

"Analysis of Dissolved Oxygen and the Application of Artificial Aeration in the Upper Passaic River," M.S. Thesis, Rutgers University, January 1967.

"Solid Waste System Cost Evaluation and Financing," presented at the Eleventh Annual Water Resources and Design Conference, Iowa State University, February 1973 (Coauthor L. J. Larson).

ES ENGINEERING-SCIENCE

"Financing Sanitary Landfills," <u>Iowa Municipalities</u>, September 1973.

Discussion of "Basic Data for Solid Waste Pilot Study," <u>ASCE</u>

<u>Journal of the Environmental Engineering Division</u>, October 1973.

"Sludge Handling and Disposal Comparisons in the Minneapolis-St. Paul Area," presented at the ASCE Environmental Engineering Division National Specialty Conference, July 1974.

"Project Cost Evaluation Using Probability Concepts," Consulting Engineer, November 1974 (Coauthor K. A. Smith).

"Planning Solid Waste Management for an Urban County," <u>Public</u> Works, November 1974 (Coauthor L. J. Larson).

"Using Probability Concepts for Project Cost Evaluation," <u>Modern Government/National Development</u>, January-February 1978 (Coauthor K. A. Smith).

"New Potable Water Supply for Jordan," presented at the Fiftieth Annual Georgia Water and Pollution Control Association Conference, August 1981.

"New Potable Water Supply for Jordan," presented at the ASCE Water Resources Planning and Management Division National Speciality Conference, March 1983 (Coauthors L. L. Pruitt and R. F. Haskins).

"Jordan Meets Water Supply Challenges," presented at the AWWA Annual National Conference, June 1983 (Coauthor L. L. Pruitt).

"Steel Pipeline Provides New Water Supply for Jordan," presented at the ASCE Speciality Conference on Pipelines in Adverse Environments II, November 1983 (Coauthors C. L. Meyer and M. C. Boner). APPENDIX B

LIST OF INTERVIEWEES

TABLE B.1
LIST OF INTERVIEWEES

	Position	Years of Service
1.	Chief, Engineering and Environmental Branch, 3800 ABW, Maxwell	4 (Gunter) 18 (Maxwell)
2.	Environmental Coordinator, 3800 ABW, Maxwell	1
3.	Plumber/Pipe Fitter, 3800 ABW, Maxwell	30
4.	Chief, Engineering Design, 3800 ABW, Maxwell	12 (Maxwell) 14 (Gunter)
5.	Asst. Chief, Training, Fire Dept., Maxwell	4
6.	Chief, Fire Dept., Maxwell	9
7.	Driver/Operator, Fire Dept., Maxwell	27
8.	Equipment Operator Foreman, 3800 ABW, Maxwell	30
9.	Vehicle Operator, 3800 ABW, Maxwell	36
10.	Supervisor, Roads & Grounds, 3800 ABW, Maxwell	31
11.	Equipment Operator Foreman, 3800 ABW, Maxwell	9 (Gunter) 22 (Maxwell)
12.	Pavements Supervisor, 3800 ABW, Maxwell	31
13.	Chief, Operations, Gunter AFS	1
14.	Mechanical Superintendent, Civil Eng., Gunter	20 (Gunter) 2 (Maxwell)
15.	Equipment Mechanic, Civil Eng., Gunter	10 (Gunter) 21 (Maxwell)
16.	Structural Superintendent, Civil Eng., Gunter	5 (Maxwell) 1 (Gunter)
17.	Foreman, Pavements & Grounds, Gunter	13 (Maxwell) 23 (Gunter)

TABLE B.1 (Continued) LIST OF INTERVIEWEES

	Position	Years of Service
18.	Power Production Specialist, CE Shop, Maxwell	1
19.	NCOIC, Heating Shop, Maxwell	1
20.	Painter, Paint Shop, Maxwell	23
21.	Chief, Fire Inspector, Fire Dept., Maxwell	1
22.	Asst. Dock Chief, 908 Reserves, Maxwell	3
23.	Fabrication Branch Chief, 3800 ABW, Maxwell	29
24.	Paint Shop, 3800 ABW, Maxwell	14
25.	Prop. Shop Supervisor, 908 Reserves, Maxwell	14
26.	3800 ABW, Maxwell	11
27.	Ground Power Repair & Support (AGE), Maxwell	27
28.	Warehouse Classified Consultant, DPDO, Gunter/Maxwell	28
29.	Paint Foreman, Civil Eng., Gunter	29
30.	Water & Waste, Civil Eng., Gunter	10
31.	NCOIC Heavy Equip., Civil Eng., Gunter	1
32.	Property Disposal Specialist, DPDO, Gunter	27
33.	Quality Control Supr., Fuels Mgmt., Maxwell	17
34.	Fuel Storage Foreman, Fuels Mgmt., Maxwell	26
35.	Plant Supervisor, Towassa Water Pollution Control Plant, Mongtomery Water Works & Sanitary Sewer Board	15
36.	Asst. Supt., Golf Course, 3800 ABW, Maxwell	1
37.	Sanitary Supt., 3800 ABW, Maxwell	28
38.	Elect. Syst. Shop Chief, 3800 ABW, Maxwell	27

TABLE B.1 (Continued) LIST OF INTERVIEWEES

	Position	Years of Service
39.	Field Maintenance Section, 3800 ABW, Maxwell	28
40.	Aircraft Welding Shop Foreman, Maxwell	29
41.	Welder/Metal Processor, Maxwell	28

TABLE B.2

OUTSIDE AGENCY CONTACTS

Name	2	Position
1.	John C. Scott	Hydrologist, 30 years, USGS - Water Resources Division, Montgomery, AL; 205/832-7510
2.	Joe Power	Engineer, 10 years, Drinking Water Supply Section, Alabama Dept. of Environmental Management, Montgomery, AL; 205/832-3170
3.	George Bryant	Superintendent, 20 years, City Water Supply Division, Montgomery Municipal Water Works, Montgomery, AL; 205/272-1246
4.	James P. Martin	Public Health Engineer, 5 years, Water Quality Section, Alabama Department of Environmental Management, Montgomery, AL; 205/277-3630
5.	Joe Hutton	Chief, Flood Plain Management/Special Studies Branch, Mobile District, U.S. Army Corps of Engineers, Mobile, AL; 205/694-3801
6.	Art Linton	Federal Facilities, U.S. Environmental Protection Agency, Region IV, Atlanta, GA; 404/881-3776
7.	C. Stubbs	Soil Conservation Service, U.S. Department of Agriculture, Auburn, AL; 205/821-8070
8.	Paul H. Moser	Environmental Geologist, Geological Survey of Alabama, University, AL; 205/349-2852

APPENDIX C
PRIMARY AND TENANT ORGANIZATIONS AND MISSIONS

APPENDIX C

PRIMARY AND TENANT ORGANIZATIONS AND MISSIONS

PRIMARY ORGANIZATION AND MISSION

The primary mission of Maxwell and Gunter is to support the Air University (AU). The 3800 Air Base Wing operates and maintains Maxwell and Gunter and provides logistic support and base services for AU organizations located on these installations. It also provides services and support for other Department of Defense agencies in accordance with current DOD and United States Air Force directives.

MAXWELL AFB

Headquarters, Air University

Air University's mission is to provide continuing professional military education for the Air Force and functions as the Air Force education, doctrinal and research center. As such it provides education to meet Air Force needs in scientific, technological, managerial and other specified professional areas.

Air War College

The mission of the Air War College is to prepare senior officers for high command and staff duty by developing a sound understanding of military strategy in support of national security policy to insure an intelligent contribution toward the most effective development and employment of aerospace power.

Squadron Officer School

The mission of the Squadron Officer School is to prepare selected captains and lieutenants for those command and staff tasks required of junior officers; to strengthen those professional values necessary for a full career of dedication and service; and to provide these officers with a foundation for further professional development.

Air Command and Staff College

The Air Command and Staff College provides an intermediate level of professional education. Its mission is to improve and broaden the professional competence of selected field grade officers; to prepare them for command and staff positions of greater responsibility.

Education and Development Center

Its mission is threefold: (a) it conducts the Academic Instructor School which is the prime preparatory training for future AU faculty members, AFROTC instructors and other teaching personnel throughout the Air Force; (b) through its International Officer School, international officers are prepared for advanced training in other AU schools and the USAF School of Aerospace Medicine; and (c) provides specialized instruction in communication skills for students currently attending other Air University courses.

Leadership and Management Development Center

Its mission is to conduct special professional development courses and to perform research, writing, lecturing and consultant services in the areas of leadership and management development.

Air University Library

Its mission is to provide research library services to the staff of the headquarters, schools, colleges and tenant units of Air University at Maxwell and Gunter.

Center for Aerospace Doctrine, Research and Education

The mission of CADRE is to conduct basic and applied aerospace power research; to assist in the development, analysis and testing of concepts, doctrine, and strategy; to conduct computerized wargaming for the Air Force; and to provide specialized educational assistance and publication support for AU academic programs.

Air University Manpower and Organization Directorate

AU/MO establishes manpower policies, determines manpower requirements and directs the development of command manpower programs.

USAF Regional Hospital-Maxwell

Its mission is to provide support in all medical and surgical specialties and to provide support to practically all military bases in the southeastern United States with medical consultations and specialized treatment for referred patients from other military facilities.

Headquarters, Civil Air Patrol

Its mission is to serve in a guidance and advisory capacity to the Civil Air patrol, helping oversee its nationwide activities.

GUNTER AFS

AF Senior NCO Academy

The mission of the AFSNCOA is to provide the education necessary for senior noncommissioned officers to become more effective leaders and managers during peace time. This is accomplished by providing a highly practical eduction to the top NCOs who supervise over 85 percent of the USAF enlisted force.

AF Logistics Management Center

The Air Force Logistics Management Center improves the capability of USAF logistics forces. To perform this mission, the Center develops, analyzes, evaluates and aids in the implementation of new or improved concepts and systems that increase the Air Force's readiness to react to and sustain combat. The AFLMC focuses on management science and operations research which will produce beneficial impacts on the Air Force logistics system.

Extension Course Institute

The Extension Course Institute supports the formal training and educational programs and provides career courses to military and civilian personnel throughout the DOD. The Institute also provides self-study material for the Air Force upgrade training program.

Air University Field Printing Plant

The Field Printing Plant provides editing and publication support AU organizations. It develops and produces textbooks and other instructional material.

TENANT ORGANIZATIONS AND MISSIONS

Maxwell AFB and Gunter AFS also host several tenant organizations. These organizations are listed below with brief descriptions of their missions.

MAXWELL AFB

Headquarters, Air Force ROTC

Its mission is to direct and give administrative assistance in the commissioning of officers to meet Air Force requirements through educational programs on college campuses.

USAF Trial Judiciary

Its mission is to provide military judges for general and special court-martials for the southeastern United States and trial counsels and defense counsels for the same area plus the Canal Zone.

Federal Prison

Its mission is a confinement facility for the housing and care of convicted federal prisoners. The camp is a minimum custody facility and inmates committed are generally from the southeastern region of the country and not considered serious offenders.

908 Tactical Airlift Group (Reserves)

Its mission is to provide air transportation for airborne forces, their equpment, and supplies with delivery by airdrop or airland; to provide intratheater airlift of personnel, equipment and supplies including tactical aeromedical evacuation within the theater of operations; and to provide intratheater airlift of personnel and cargo when required.

1973 Communications Squadron

Its mission is to provide communications and electronics support to Maxwell AFB and Gunter AFS.

Det. 9, 24 Weather Squadron

Its mission is to provide routine and specialized weather services to the Headquarters, Air University, Maxwell AFB, and other DOD units in support of the Air Weather Service worldwide mission.

Det. 3, 1402 Military Airlift Squadron

Its mission is to provide operational airlift support to Department of Defense personnel under the direction of Military Airlift Command. The unit provides air transport to and from destinations throughout the continental United States utilizing CT-39A aircraft in support of centrally scheduled and directed missions.

District 8, OSI(IG), HQ USAF

Its mission is to provide criminal, counter intelligence, internal security, and special investigative services for all Air Force activities and to perform distinguished visitor protective services and operations as authorized.

Corps of Engineers

Its mission is to administer and inspect military construction contracts (MCP) at Maxwell and Gunter. This office also coordinates the needs of the Air Force for a facility under construction with the contractor and the designer.

USAF Postal & Courier Flights

Its mission is to provide personal mail service to all authorized personnel assigned to Maxwell and to forward all undeliverable mail addressed to personnel having departed Maxwell.

Other Maxwell Tenant Units

USAF Auditor General Representative Office
Air Force Medical Management Team
Albert F. Simpson Historical Research Center
Community College of the Air Force
Defense Investigative Service
Federal Aviation Administration
United States Post Office

GUNTER AFS

AF Data Systems Design Center

The mission of the center is to promote accomplishment of the Air Force mission by providing automated data processing capabilities to major commands and field units located around the world. The work of the center permits the effective and efficient achievement and maintenance of readiness, survivability and sustainability.

AF Data Systems Evaluation Center

The Center provides independent quality assurance assessments of automated data processing systems and provides expert consultant program management support to program managers.

AF Automated Systems Project Office

The AFASPO's mission is to acquire new automated data processing systems. Currently four major Air Force acquisition programs are handled by the AFASPO. The program which gave the AFASPO its start and original name (Phase IV Program Management Office) is the Base-Level Data Automation Program which began in 1976. In 1979, the AFASPO was made responsible for the Inter-Service/Agency Automated Message Processing Exchange Program. Two more programs were assigned in 1981 - The Air Force Automated Message Processing Exchange Program and the Telecommunications Center Upgrade Program.

Defense Property Disposal Office

Its primary mission is to provide reutilization of military owned personal property. Utilization specialists work full time to find "new homes" for used material.

3531 Recruiting Squadron

The 3531 Recruiting Squadron has approximately 100 personnel recruiting young men and women in three states. The squadron is responsible for the recruitment of both officers and enlisted personnel in the majority of Alabama, Georgia and the panhandle of Florida.

APPENDIX D

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX D

MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment Storage & Disposal Methods
3800 Air Base Wing/908 Air Re	serve Group	(Consolidat	ed Mainten	ance)
Aerospace Ground Equipment (AGE)	848/1025	Yes	Yes	Contractor/ DPDO
Electric/Battery	848	Yes	Yes	Contractor/DPDC
Non-destructive Inspection	848	Yes	Yes	DPDO/Sanitary Sewer
Metal Processing/Welding	848	Yes	No	
Corrosion Control/Paint	848	Yes	Yes	Contractor
Pneudraulics	848	Yes	Yes	DPDO
Machine Shops	848	Yes	Yes	DPDO
Structural Shop	848	Yes	No	.
908 Air Reserve Group/Mainten	ance			
Flightline Maintenance	.689	Yes	Yes	To Bldg. 848/ DPDO
Survival Equipment	1002	Yes	No	
Engine/Propeller	848	Yes	Yes	DPDO
Tire	848	Yes	Yes	DPDO
3800 Air Base Wing (ABW)/Main	tenance			
Flightline Maintenance	848	Yes	Yes	DPDO/FPTA
Communications, Navigation & Instruments	848	Yes	Yes	

APPENDIX D (Continued) MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes			
3800 Air Base Wing (ABW)/Maintenance (Continued)						
Transient Aircraft Maintenance	844	Yes	Yes	To Pldg. 848/ DPDO		
Precision Measuring Equipment Laboratory	1017	Yes	Yes	DPDO		
ABW/Supply	,			حظومتر ساق من في والمناو من منظ منظ من برق والحرف المنط المنظ من المنظ ا		
Fuels Storage/Inspection	1101/1104	Yes	Yes	DPDO/FPTA/ Landfill		
Service Station	913	Yes	Yes	DPDO		
Vehicle Maintenance (General and Heavy Equipment)	936	Yes	Yes	O-W Separators/ DPDO		
Refueling Vehicle Maintenance	1063	Yes	Yes	DPDO		
Lawn Mower Maintenance	924	Yes	Yes	DPDO		
ABW/Morale, Welfare & Recreati	on		 			
Auto/Wood Hobby Shop	715	Yes	Yes	DPDO		
ABW/Services						
Laundry/Dry Cleaning	912	Yes	No			
ABW/Base Civil Engineering						
Protective Coating Paint	78	Yes	Yes	Contractor/ Landfill		

APPFNDIX D (Continued) MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	
ABW/Pase Civil Engineering (Co	ntinued)			
Metal Working (Sheet Metal)	78	Yes	No	
Heating Systems Maintenance	78	Yes	Yes	Contractor/DPDO
Carpenter	78	Yes	No	
Plumbing	78	Yes	No	
Interior Electric	78	Yes	No	
Exterior Electric	78	Yes	Yes	Contractor/DPDO
Power Production	82	Yes	Yes	Contractor
Welding	82	Yes	No	
Refrigerating/Air Conditioning	82	Yes	No	
Pavement & Grounds	1334	Yes	Yes	Sanitary Sewer
Entomology	1334	Yes	Yes	Sanitary Sewer
Fire Protection	1043	Yes	Yes	Evaporation Pond
Heating & Air Conditioning Plant	1410	Yes	Yes	Boilers
Golf Course Maintenance	1441	Yes	Yes	Landfill
ABW/Administration				
Maxwell Duplicating	1006	Yes	No	
Micrographics Production	914	Yes	No	

APPENDIX D (Continued) MASTER LIST OF INDUSTRIAL SHOPS

	<u> </u>			
Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	
1973D Communications Squadron				
Outside Plant	929	Yes	No	
Inside Plant	929	Yes	No	
Nav Aids Maintenance	929	Yes	No	
Cable Maintenance	929	Yes	No	
Weather Equipment Maintenance	929	Yes	No	
Crytographic Maintenance	929	Yes	No	
Ground Radio Maintenance	929	Yes	No	
Teletype Maintenance	929	Yes	No	
Television Maintenance	802/1402	Yes	No	
USAF Hospital Maxwell				
Nuclear Medicine	50	Yes	Yes	Contractor/ Manufacturer
Radiology	50	Yes	Yes	DPDO/Sanitary Sewer
Dental Clinic	50	Yes	Yes	DPDO/Sanitary Sewer
Hospital Laboratory	50	Yes	Yes	Incineration/ Sanitary Sewer
Pathology	50	Yes	Yes	Incineration/ Contractor
Surgery	50	Yes	Yes	Incinerator

APPENDIX D (Continued) MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials		• •
Audiovisual Service Center (D-	K Associate	es)		
Photographic Laboratory	1214	Yes	Yes	Contractor
Civil Air Patrol, USAF				
Printing Plant	747	Yes	No	
3800 Air Base Squadron (ABS)/C	ivil Engine	eering (Gunt	er AFS)	
Pavements/Grounds Maintenance	560	Yes	Yes	Surface Drain- age/Contractor
Entomology	503	Yes	Yes	Landfill/ Sanitary Sewer
Structural Maintenance	505	Yes	No	
Protective Coating (Paint)	512	Yes	Yes	Contractor/ Landfill
Plumbing	326	Yes	No	
Sheet Metal/Welding	502	Yes	No	
Refrigeration/Air Conditioning	503	Yes	No	
Heating Systems Maintenance	326	Yes	No	
ABS/Morale, Welfare & Recreati	on			
auto Hobby Shop	715	Yes	Yes	DPDO

APPENDIX D (Continued) MASTER LIST OF INDUSTRIAL SHOPS

	 	<u> </u>	
715	Yes	Yes	DPDO
408	Yes	Yes	DPDO
847	Yes	No	
209	Yes	Yes	DPDO/Sanitary Sewer
	Location (Bldg. No.) 715 408	Location Handles (Bldg. Hazardous No.) Materials 715 Yes 408 Yes	Location Handles Generates (Bldg. Hazardous Hazardous No.) Materials Wastes 715 Yes Yes 408 Yes Yes 847 Yes No

APPENDIX E

SUPPLEMENTAL BASE ENVIRONMENTAL DATA

TABLE E.1
ANALYSIS RESULTS FOR SAMPLING POINT
0128NA001
(Storm Drainage Influent to Base)
Maxwell AFB

1) (ug/1) (ug/1) (ug/1) (std. units) (ug/1) (ug/1) (ug/1) (ug/1) (std. units) (ug/1) (ug/1) (ug/1) (ug/1) (std. units) (ug/1) (ug/1) (ug/1) (std. units) (ug/1) (std. units)		^	
95.6 <10 <50 <5 233 <10 348 <5 267 <10 <50 <5 1,158 <10 <50 <5 400 <10 345 <5 1,500 <10 221 <5 1,500 <10 1,276 <5 150 <10 258 <5 240 <10 <50 <5 240 <10 <50 <5 240 <10 <50 <5 240 <10 <50 <5 240 <10 <50 <5 240 <10 <50 <5 240 <10 <50 <5 250 <10 <50 <5 250 <10 <50 <5 250 <10 <50 <5 250 <10 <50 <5 250 <10 <50 <5 250 <10 <50 <5 250 <10 <50 <5 250 <10 <50 <5	Phenols (ug/1)		Grease Cyanide P (mg/l) (mg/l) (
233 <10	<10	0.01	480 <0.01
267 <10	82	0.01	0.9 <0.01
1,158 <10	<10	0.01	1.8 <0.01
400 <10	18	0.03	23.2 0.03
96 <10	14	0.01	58.8 <0.01
34 <10	20	0.01	
1,500 <10	250	0.01	86.4 0.01
150 <10	<10	0.01	
240 <10	<10	0.01	
250 <10 <50 <5 400 <10 <50 <5 350 <10 374 <5	16	0.01	
400 <10	<10	0.01	
350 <10 374 <5	<10	0.01	55.2 <0.01
	<10	0.01	98.4 <0.01

 The Note: The water quality classification for the Alabama River near Maxwell AFB is "Fish and Wildlife", specific water quality criteria for this classification is shown following Table E.2 in this appendix.

TABLE E.2 LIST OF PESTICIDES CURRENTLY IN USE MAXWELL AFB AND GUNTER AFS

Maxwell AFB

Kromad
Daconil
Paraquat
Methyl Bromide
Zeptox

Riverside 9-12 Actidione Thiram

Sevin Round-up Chipco Diazinon

Diazinon Diquat Proxol Balan

Ronstar G Thiram Kerb Koban Fore Cutrine Amdro

Propoxhr Dursban M Pyrethrin Malathion Zinc Phosphide

Sevin Diphacin

Super Zepticide

Chlordane

Urox "B" Bromocil Urox 22 Monuron

2,4-D

Perma Dust PT 240 Bolt pyrethrin

Gunter AFS

Round-up
Prometone
2,4-D
Malathion
Warfrain
Diazinon
Baygon
Bolt Pyrethrin

Diphacin
Resmethrin
Vaponite
Amdro
Dipterex
D-tox 4E
d-Phenothrin
Lindane

D. FISH AND WILDLIFE

Best Usage of Waters: Fishing, propagation of fish, aquatic life, and wildlife, and any other usage except for swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes.

Conditions Related to Best Usage: The waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.

Items

- Sewage, industrial wastes, or other wastes.
- 2. pH

3. Temperature

Specifications

None which are not effectively treated in accordance with Section V of these criteria.

Sewage, industrial wastes or other wastes shall not cause the pH to deviate more than one unit from the normal or natural pH, nor be less than 6.0, nor greater than 8.5. For salt waters and estuarine waters to which this classification is assigned, wastes as herein described shall not cause the pH to deviate more than one unit from the normal or natural pH, nor be less than 6.5, nor greater than 8.5.

- a. The maximum temperature in streams, lakes, and reservoirs, other than those in river basins listed in Part b. hereof, shall not exceed $90^{\circ}F$.
- b. The maximum temperature in streams, lakes, and reservoirs in the Tennessee and Cahaba River Basins, and for that portion of the Tallapoosa River Basin from the tailrace of Thurlow Dam at Tallassee downstream to the junction of the Coosa and Tallapoosa Rivers which has been designated by the Alabama Department of Conservation and Natural Resources as supporting smallmouth bass, sauger, or walleye, shall not exceed 86°F.
- c. The maximum in-stream temperature rise above ambient water temperature due to the addition of artificial heat by a discharger shall not exceed 5°F in streams, lakes, and reservoirs in non-coastal and non-estuarine areas.

(3. Temperature - Cont'd)

- d. The maximum in-stream temperature rise above ambient water temperature due to the addition of artificial cat by a discharger shall not exceed 4°F in coastal or estuarine waters during the period October through May, nor shall the rise exceed 1.5°F luring the period June through September.
- e. In lakes and reservoirs there shall be no withdrawal from, nor discharge of heated waters to, the hypolimnion unless it can be shown that such discharge or withdrawal will be beneficial to water quality.
- f. In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained, and there shall be no thermal block to the migration of aquatic organisms.
- g. Thermal permit limitations in State discharge permits may be less stringent than those required by criteria a. - d. hereof when a showing by the discharger has been made pursuant to Section 316 of the Federal Water Pollution Control Act (FWPCA), 33 U.S.C. 1251 et seq. or pursuant to a study of an equal or more stringent nature required by the State of Alabama authorized by Title 22, Section 22-22-9(c), Code of Alabama, 1975, that such limitations will assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife, in and on the body of water to which the discharge is made. Any such demonstration shall take into account the interaction of the thermal discharge component with other pollutants discharged.

Dissolved Oxygen

For a diversified warm water biota, including game fish, daily dissolved oxygen concentrations shall not be less than 5 mg/l at all times; except under extreme conditions due to natural causes, it may range between 5 mg/l and 4 mg/l, provided that the water quality is favorable in all other parameters. The normal seasonal and daily fluctuations shall be maintained above these levels. In no event shall the dissolved oxygen level be less than 4 mg/l due to discharges from existing impoundments. All new impoundments shall be designed so that the discharge will

(4. Dissolved Oxygen - Cont'd)

contain at least 5 mg/l dissolved oxygen where practicable and technologically possible. The Environmental Protection Agency in cooperation with the State of Alabama and parties responsible for impoundments, shall develop a program to improve the design of existing facilities.

In coastal waters, surface dissolved oxygen concentrations shall not be less than 5 mg/l, except where natural phenomena cause the value to be depressed.

In estuaries and tidal tributaries, dissolved oxygen concentrations shall not be less than 5 mg/l, except in dystrophic waters or where natural conditions cause the value to be depressed.

In the application of dissolved oxygen criteria referred to above, dissolved oxygen shall be measured at a depth of 5 feet in waters 10 feet or greater in depth; and for those waters less than 10 feet in depth, dissolved oxygen criteria will be applied at mid-depth.

Only such amounts, whether alone or in combination with other substances, as will not be injurious to fish and aquatic life, including shrimp and crabs in estuarine or salt waters or the propagation thereof; not to exceed one-tenth of the 96-hour median tolerance limit for fish and aquatic life, including shrimp and crabs in salt and estuarine waters, except that other limiting concentrations may be used when factually justified and approved by the Commission.

Only such amounts, whether alone or in combination with other substances, as will not be injurious to fish and aquatic life, including shrimp and crabs in estuarine and salt waters or adversely affect the propagation thereof; impair the palatability or marketability of fish and wildlife or shrimp and crabs in estuarine and salt waters; unreasonably affect the aesthetic value of waters for any use under this classification.

5. Toxic substances attributable to sewage, industrial wastes, or other wastes.

 Taste, odor, and colorproducing substances attributable to sewage, industrial wastes, and other wastes. 7. Bacteria

Bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000/100 ml on a monthly average value; nor exceed a maximum of 2,000/100 ml in any sample.

8. Radioactivity

The concentrations of radioactive materials present shall not exceed the requirements of the State Department of Public Health.

9. Turbidity

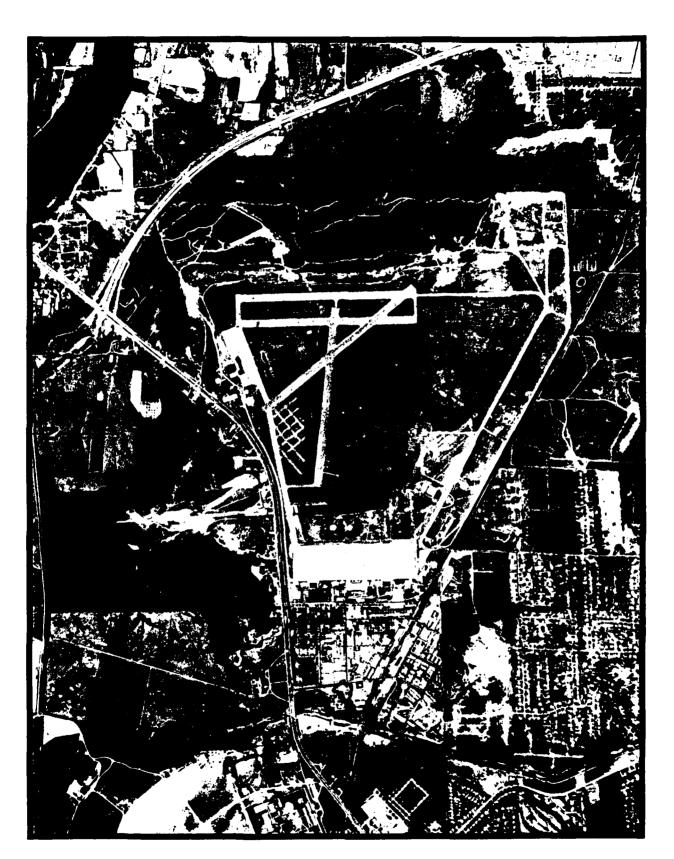
There shall be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of waters or interfere with any beneficial uses which they serve. Furthermore, in no case shall turbidity exceed 50 Nephelometric above background. Background will be interpreted as the natural condition of the receiving waters without the influence of man-made or man-induced causes. Turbidity levels caused by natural runoff will be included in establishing background levels.

APPENDIX F

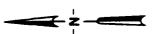
SITE PHOTOGRAPHS

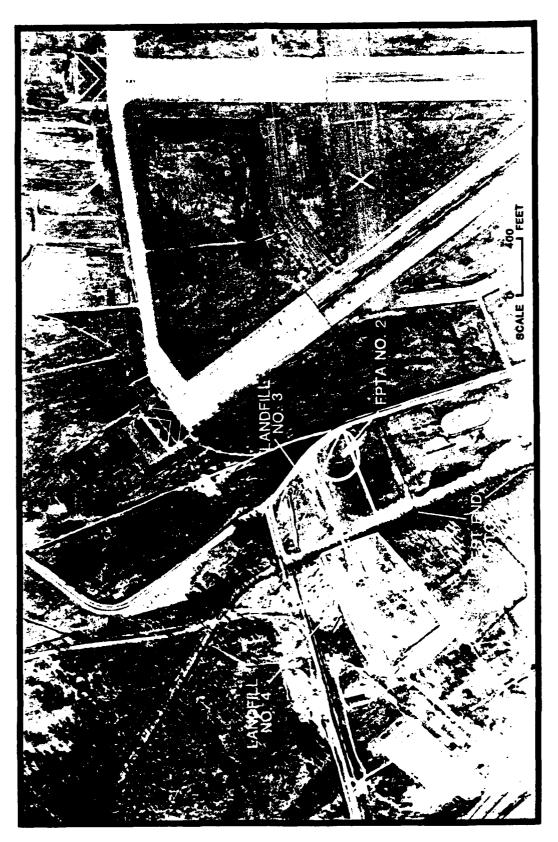


MAXWELL AFB, ALABAMA AUGUST, 1969



GUNTER AFS, ALABAMA AUGUST, 1969





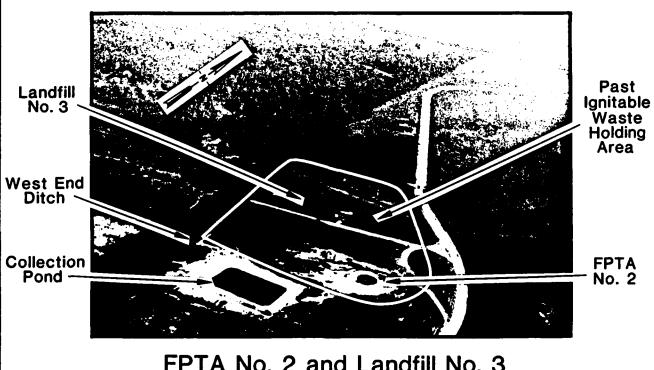
MAXWELL AFB, ALABAMA FEBRUARY 23, 1960

MAXWELL AFB Landfill No. 2 West End Ditch Landfill No. 2 Hardfill Area No. 1 Family Camp West End Ditch Hardfill Area No. 1 ES ENGINEERING - SCIENCE

MAXWELL AFB



FPTA No. 1 and Hardfill Area No. 2



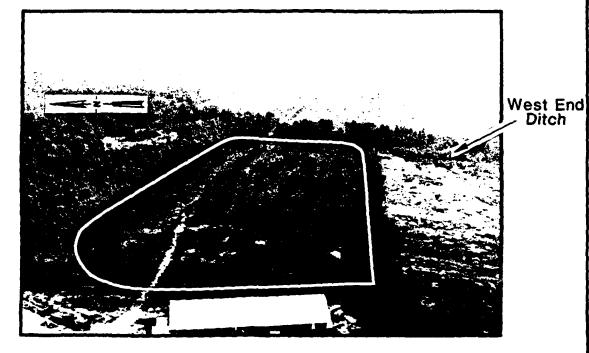
FPTA No. 2 and Landfill No. 3

Past

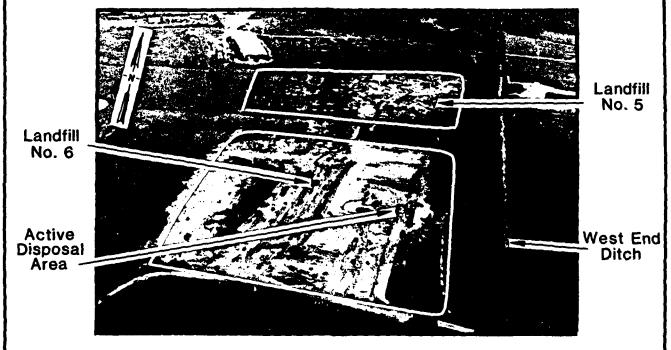
Area

FPTA No. 1

MAXWELL AFB



Landfill No. 4



Landfill No. 5 and No. 6

MAXWELL AFB



Landfill No. 6
(Looking North)



Fire Protection Training Area No. 2 (Looking South)

Active
Disposal
Area

Evaporation

Pond

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

"develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH₂M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH₂M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percert. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

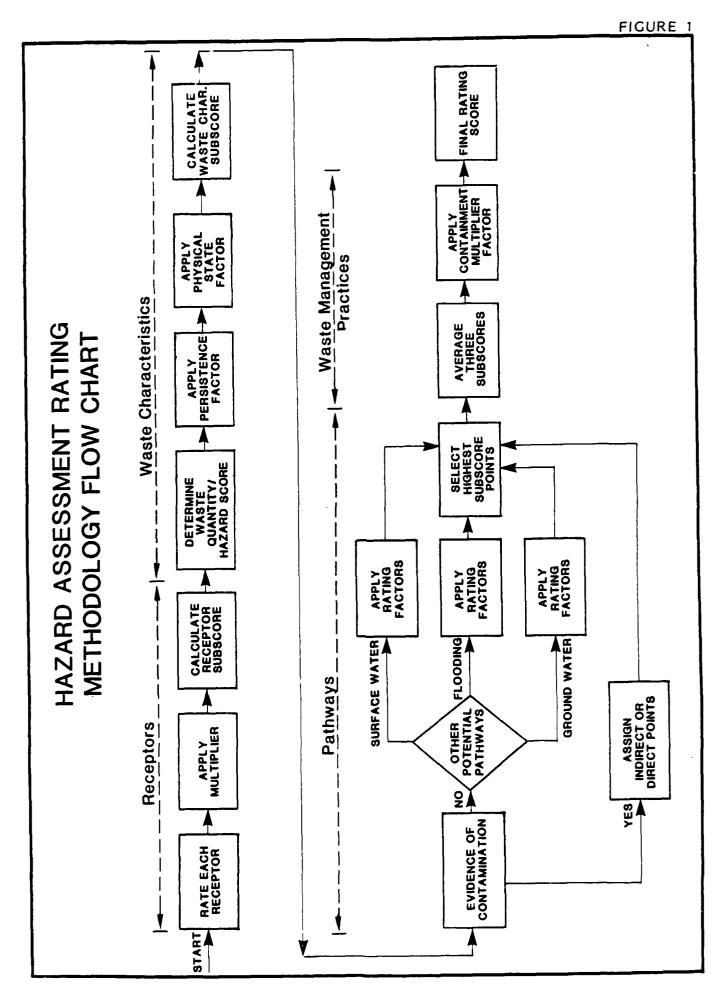


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Page 1 of 2

VAME OF STOR				
NAME OF SITE				
DATE OF OPERATION OR OCCURRENCE				
OWNER/OPERATOR				
COMMENTS/DESCRIPTION_				
SITE RATED BY				
I. RECEPTORS Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals		
Receptors subscore (100 X factor sc	ore subtota	l/maximum score	subtotal)	
II. WASTE CHARACTERISTICS				
A. Select the factor score based on the estimated quantit the information.	y, the degr	ee of hazard, a	and the confi	dence level
1. Waste quantity (S = small, M = medium, L = large)				
 Confidence level (C = confirmed, S = suspected) 				
 Hazard rating (H = high, M = medium, L = low) 				
Factor Subscore A (from 20 to 100 based	on factor	score matrix)		
B. Apply persistence factor Factor Subscore A X Persistence Factor = Subscore B				•
C. Apply physical state multiplier				
Subscore 3 X Physical State Multiplier = Waste Charact	erieriae en	bacore		
x				

IIL PATHWAYS

	Rati	ng Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Α.	dir	there is evidence of migration of hazardous ect evidence or 80 points for indirect evid dence or indirect evidence exists, proceed	lence. If direct evi			
					Subscore	
в.		e the migration potential for 3 potential praction. Select the highest rating, and pro-		ter migration,	flooding, ar	nd ground-water
	1.	Surface water migration				
		Distance to mearest surface water		88		
		Net precipitation		6		
		Surface erosion		8		
		Surface permeability		6		·
		Rainfall intensity		8		
				Subtotals	****	
		Subscore (100 X i	factor score subtotal	/maximum score	subtotal)	
	2.	Flooding		1		
			Subscore (100 x f	actor score/3)		
	3.	Ground-water migration				
		Depth to ground water		8		·
		Net precipitation		6		
		Soil permeability		8		
		Subsurface flows		8		
		Direct access to ground water		8		
				Subtotals		
		Subscore (100 x f	factor score subtotal	/maximum score	subtotal)	
c.	Hig	hest pathway subscore.				
	Ent	er the highest subscore value from A, B-1,	B-2 or B-3 above.			
				Pathway	s Subscore	
	· .	ASTE MANAGEMENT PRACTICES				
λ.	yA6	rage the three subscores for receptors, was		and pathways.		
			Receptors Waste Characteristi Pathways	C\$		
			Total	divided by 3	e Gros	se Total Score
3.	λợp	ly factor for waste containment from waste	management practices			
	Gro	ss Total Score X Waste Management Practices	Factor = Final Scor	e		
				Х		

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES TABLE 1

Multiplier 9 6 Ç 2 9 10 Drinking water, no municommercial, industrial, or irrigation, no other Major habitat of an enwater source available. dangered or threatened species; presence of recharge area; major cipal water available; Potable water supplies Greater than 1, 000 Greater than 1,000 Greater than 100 0 to 3,000 feet 0 to 1,000 feet Residential wetlands. 3,001 feet to 1 mile 1,001 feet to 1 mile tion and harvesting. sources susceptible economically imporareas; presence of Shellfish propaga-Pristine natural areas; minor wetto contamination. lands; preserved tant natural re-Drinking water, municipal water Commercial or industrial 51 ~ 1,000 available. 51 - 1,000 - 100 56 Rating Scale Levels gation and manage-Recreation, propament of fish and irrigation, very Commercial, inwater sources. limited other Natural areas dustrial, or Greater than 3 miles 1 to 3 miles Greater than 2 miles 1 to 2 miles Completely remote Agricultural (zoning not applicable) wildlife. 1 - 25 S 1 - 50 1 sources readily available. Agricultural or industrial use. Not used, other Not a critical 0 environment 0 0 0 Distance to installation Land Use/Zoning (within aquifer supplies within 3 miles of site Population within 1,000 feet (includes on-base P. Water quality/use designation of nearest surface water supplies E. Critical environments (within 1 mile radius) H. Population served by within 3 miles down-I. Population served by Ground-Water use of RECEPTORS CATEGORY Distance to nearest Burface water body uppermost aquifer Rating Factors stream of site 1 mile radius) facilities) water well boundary

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TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

WASTE CHARACTERISTICS Ξ.

Hazardous Waste Quantity N-1

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

Confidence Level of Information A-2 C = Confirmed confidence level (minimum criteria below)

S * Suspected confidence level

o Verbal reports from interviewer (at least 2) or written information from the records.

o No verbal reports or conflicting verbal reports and no written information from the records.

> o Knowledge of types and quantities of wastes generated by shops and other areas on base.

o Based on the above, a determination of the types and quantities of waste disposed of at the site.

quantities of hazardous wastes generated at the o Logic based on a knowledge of the types and base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

		Rating Scale Levels	918	
Hazard Category	0	-	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200*F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point at 80°F Flash point less than to 140°F 80°F
Radioactivity	At or below background levels	<pre>1 to 3 times back- ground levels</pre>	3 to 5 times back- ground levels	Over 5 times back- ground levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Points	- 5 a
Hazard Rating	High (H) Medium (M) Low (L)

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Naste Characteristics Matrix

면형		ì	1	1	ı	ŧ	i	1
Hazard	æ	X E	=	ΞΣ	Z li z z	E E J J	772	١
Confidence Level of Information	υ	U U	so.	O O	တပထပ	ພດດທ	ပတစ	S
Hazardous Waste Quantity	ų	2 I	ı.	σ Σ	HJIN	WII	w E w	S
Point Rating	100	80	0,	09	20	0+	30	20

o Wastes with the same hazard rating can be added o Wastes with different hazard ratings can only be added

o Confirmed confidence levels (C) can be added o Suspected confidence levels (S) can be added o Confirmed confidence levels cannot be added with

suspected confidence levels

Waste Hazard Rating

in a downgrade mode, e.g., MCM + SCH = LCM if the

total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

B. Persistence Multiplier for Point Rating

Multiply Point Rating From Part A by the Following	1.0		6.0		0.8	₽.0	
Persistence Criteria	Metals, polycyclic compounds,	and halogenated hydrocarbons	Substituted and other ring	combonings	Straight chain hydrocarbons	Easily biodegradable compounds	

C. Physical State Multiplier

Multiply Point Total From	races A and B by the following	1.0	0.75	0.50
ohina (se)	ruysical state	Liquid	Sludge	Solid

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated. Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

		Rating Scale Levels	els		
Rating Factor	0	-	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	∞
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	9
Surface erosion	None	Slight	Moderate	Severe	æ
Surface permeability	0% to_15% clay (>10 cm/sec)	15% to 30% clay 30% to 50% clay (10 to 10 cm/sec) (10 to 10 cm/sec	30% to 50T% clay (10 to 10 cm/sec)	Greater than 50% clay (<10 cm/sec)	9
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	&
B-2 POTENTIAL POR PLOODING					
Floodplain	Beyond 100-year floodplain	In 25-year flood- plain	In 10-year flood- plain	Floods annually	-
B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION	R CONTAMINATION				
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8 0
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	9
Soil permeability	Greater than 50% clay (>10 cm/sec)	391 to 503 clay 151 to 303 clay (10 to 10 cm/sec) (10 to 10 cm/sec)	15% to 30% clay (10 to 10 cm/sec)	0% to 15% clay (<10 cm/sec)	60
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently sub- merged	Bottom of site lo- cated below mean ground-water level	œ
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures	No evidence of risk	Low risk	Moderate risk	High risk	∞

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

- This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores. ż
- B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Multiplier	1.0 0.95 0.10		Surface Impoundments:	o Liners in good condition	Sound dikes and adequate freeboard	Adequate monitoring wells		Fire Proection Training Areas:	Concrete surface and berms	Oil/water separator for pretreatment of runoff	Bffluent from oil/water separator to treatment plant
Waste Management Practice	No containment Limited containment Fully contained and in full compliance	Guidelines for fully contained:	Landfills: Sur	o Clay cap or other impermeable cover	o Leachate collection system	o Liners in good condition	o Adequate monitoring wells	Spills: Pir	o Quick spill cleanup action taken	o Contaminated soil removed	o Soil and/or water samples confirm o total cleanup of the spill

Gen cal Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

SITE ASSESSMENT RATING FORMS

APPENDIX H

TABLE OF CONTENTS HAZARD ASSESSMENT RATING METHODOLOGY MAXWELL AIR FORCE BASE

	HARM Score	Page No.
Electroplating Waste Disposal Site	72	H-1
Surface Drainage System	72	H-3
Fire Protection Training Area No. 2	59	H-5
Fire Protection Training Area No. 1	58 .	H-7
Landfill No. 4	54	н-9
C. E. Drum Storage Area	53	H-11
Landfill No. 5	52	H-13
Landfill No. 6	52	H-15
Landfill No. 2	51	H-17
Landfill No. 3	51	н-19
Hardfill Area No. 2	44	H-21

HAZARD ASSESSMENT RATING METHODOLOGY FORM ELECTROPLATING WASTE DISPOSAL SITE EAST OF BUILDING 1110 Location: Date of Operation or Occurance: LATE 1948'S - MID 1968'S Owner/Boerator: NAXWELL AFR Comments/Description: DRUM TISPOSAL OF PLATING SOLUTIONS (TRENCH & FILL) Site Rated by: R. M. REYNGLDS I. RECEPTORS Factor Multi- Factor Maximum Rating plier Score Possible Rating Factor (#-3) Score 8 12 A. Population within 1,000 feet of site 3 13 39 30 B. Distance to nearest water well 2 C. Land use/zoning within I mile radius 3 6 D. Distance to reservation boundry 3 6 :8 19 10 E. Critical environments within 1 mile radius of site 1 F. Water quality of nearest surface water body 6 6. Ground water use of uppermost aquifer Ø 27 3 18 H. Population served by surface water supply within 3 miles downstream of site 3 18 I. Population served by ground-water supply within 3 miles of site Subtotals 180 Receptors subscore (160 x factor score subtotal/maximum score subtotal) 58 II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information. 1. Waste quantity (1=small, 2=medium, 3=large) Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor score matrix) 89 B. Apply persistence factor Factor Subscore A x Persistence Factor = Subscore B 88 x 1.00 = 89 C. Apply physical state multiplier Subscore B x Physical State Multiplier = Waste Characteristics Subscore 1.00 ========

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier		
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			72	84
Subscore (100 x factor score subtotal	/maximum s	score subt	otal)	86
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal.	/maximum s	core subt	otal)	81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 86

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 50
Waste Characteristics 80
Pathways 86
Total 216 divided by 3 =

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score

72 x 1.00 = \ 72 \

72 Gross total score

H-2

HAZARD ASSESSMENT RATING METHODOLOGY FORM Name of Site: SURFACE DRAINAGE SYSTEM Location: BASE-WIDE Date of Operation or Occurance: 1940'S - EARLY 1970'S Owner/Operator: MAXWELL AFE Comments/Description: RECEIVED NUMEROUS INDUSTRIAL WASTE BOLUTIONS. Site Rated by: R. M. REVNOLDS I. RECEPTORS Factor Multi- Factor Maximum Rating plier Score Possible Rating Factor (6-3)Score A. Population within 1,000 feet of site B. Distance to mearest water well 3 16 3Ø 39 C. Land use/zoning within 1 mile radius 2 3 ç 6 D. Distance to reservation boundry 3 6 19 18 E. Critical environments within 1 mile radius of site 12 **g** 30 F. Water quality of nearest surface water body Ø 6. Ground water use of uppermost aquifer 27 H. Population served by surface water supply 6 3 18 within 3 miles downstream of site I. Population served by ground-water supply 3 6 18 18 within 3 miles of site Subtotals 84 162 Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52 II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor score matrix) B. Apply persistence factor Factor Subscore A x Persistence Factor = Subscore B 199 9.98 = C. Apply physical state multiplier Subscore B x Physical State Multiplier = Waste Characteristics Subscore x 1.68 =======

III. PATHWAYS

A. If there is evidence of migration of hozardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier		Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	0	8	0	0
Net precipitation	2	6	12	18
Surface erosion	Õ	8	0	0
Surface permeability	1	6	6	•
Rainfall intensity	3	8	24	
Subtotals			42	60
Subscore (100 x factor score subtotal	/maximum s	score subt	otal)	70
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	0
Direct access to ground water	3	8	24	24
Subtotals			76	90
Subscore (100 x factor score subtatal	/maximum s	score subt	otal)	84
Highest pathway subscore.				

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 84

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 52 Waste Characteristics 90 Pathways 84

Total 226 divided by 3 = 75 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score

> 75 0.95 72

Name of Site: FIRE PROTECTION TRAINING AREA NG. 2				
Location: BUILDING 1143 Date of Operation or Occurance: 1962 - FRESENT				
Date by operation or becommine. 1962 (mester) Owner/Brenator: MAXWELL AFB				
Comments/Description: BURNET WASTE GILB, FUELB, SOLVEN	TB. THINNERS (1952 - 19	74 .	
Site Rated by: R. M. REYNGLES				
I. FECEFTORS				
		Multi-		
	-			Possible
Rating Factor	(6- 3)			Score
A. Population within 1.000 feet of site	1		1	17
B. Distance to mearest water well	÷	15	7,5	
C. Land use/zoning within 1 mile radius	;	••	7	
D. Distance to reservation boundry	•	- L	10	19
E. Critical environments within 1 mile radius of site	1	16	10 10	7.8
	1 -	1 2 *	.0	er ta
F. Water quality of nearest surface water body	r.	5	20	13
6. Ground water use of uppermost aquifer	9 7	7 6	v 9	27 15
H. Population served by surface water supply	ø	b	Ð	19
within 3 miles downstream of site	-	,		10
1. Fopulation served by ground-water supply	5	6	18	18
within 3 miles of site				
Subto	tals		82	188
		ototal)		46
Receptors subscore (100 x factor score subtotal/max	xibum score sul			
Receptors subscore (100 x factor score subtotal/ma.	xlaum score sul			=======================================
	xiwum score sul			
II. WASTE CHARACTERISTICS			and the c	
II. WASTE CHARACTERISTICS			and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information.			and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large)	the degree of		and the c	
 II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 	the degree of		and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high)	the degree of		and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected)	the degree of		and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor)	the degree of	hazard, a	and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor state) 5. Apply persistence factor	the degree of	hazard, a	and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor)	the degree of	hazard, a	and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor state) 5. Apply persistence factor	the degree of	hazard, a	and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from IR to 100 based on factor state) 5. Apply persistence factor Factor Subscore A x Persistence Factor = Subscore B 82 x 0.36 =	the degree of 3 1 2 Score matrix)	hazard, a	and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from IP to 100 based on factor state) 5. Apply persistence factor Factor Subscore A x Persistence Factor = Subscore B 82 x 8.36 =	the degree of 3 1 2 score matrix)	hazard, a	and the c	
II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor state) 5. Apply persistence factor Factor Subscore A x Fersistence Factor = Subscore B 80 x 0.30 =	the degree of 3 1 2 score matrix)	hazard, a	and the c	

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

B. Rate the migration potential for 3 potential pathways; surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)			Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			82	108
Subscore (100 x factor score subtotal	/moximum s	score subf	total)	76
2. Flooding	2	i	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	2	8	16	24
Subtotals			84	114
Subscore (100 x factor score subtota)	l/maximum s	score subf	total)	74
Winhart nothuny subscape.				

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

76 Pathways Subscore

IV. WASTE HANAGEHENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors Waste Characteristics 64 Pathways 76 Total 186 divided by 3 =

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

62 0.95 59

62 Gross total score

		ON TRAINING AREA NO.					
Location:	NORTH OF BUIL						
Date of Operation	or Scourance:	1940'S - 1962					
Owner/Operator:	MAXWELL AFB						
Comments/Descript	ion: BURN	ED WASTE FUELS, NAST	TE MILO, BOLVENTO, PAI	NT THINNER	3 .		
Site Rated by:	R. M. REYNOLD	S					
1. RECEFTORS							•
Transfer Tonis			Factor	Multi-	Factor	Maxiaum	
			Rating	plier	Score	Possible	
Rating Factor			(9-3)				
A. Population wit	hin 1 BBE foot	of site	1	4	4	12	
B. Distance to ne			÷,	, 1#	28	39	
C. Land use/zonin			1	1# 3	3	ç	
D. Distance to re			; 3		13	13	
		ury :1 mile radius of si		19	19	39	
F. Water quality			1		á		
r. water quality 6. Ground water u			g		£		
H. Population ser	• • •	-			ø		
within 3 miles			•		•		
I. Population ser			2	6	18	18	
within 3 miles	, •	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-	_			
***************************************	5. 5		•				
			Subtotals		79	180	
Receptor	s subscore (19	Ø x factor score suì	ototal/maximum score s	ubtotal)		44	
						=======================================	
II. WASTE CHARACT							
A. Select the fac		d on the estimated o	quantity, the degree o	f hazard,	and the d	onfidence leve	l of
		d on the estimated o	quantity, the degree o	f hazard,	and the c	onfidence leve	l of
A. Select the fac the informatio	n.	d on the estimated o		·	and the c	onfidence leve	l of
A. Select the fac the informatio	n. quantity (1=s	mall, 2-medium, 3-la	erge) 3	·	and the c	onfidence leve	l af
A. Select the fac the informatio 1. Waste 2. Confi	n. quantity (1=s dence level (1		erge) 3		and the c	onfidence leve	l af
the informatio 1. Waste 2. Confi 3. Hazar	n. quantity (1=s dence level (1 d rating (1=lo	mall, 2-medium, 3-la -confirmed, 2-suspec w, 2-medium, 3-high)	erge) 3 (ted) 1		and the c	onfidence leve	l of
A. Select the fac the informatio 1. Waste 2. Confi 3. Hazar	n. quantity (1=s dence level (1 d rating (1=lo	mall, 2-medium, 3-la -confirmed, 2-suspec w, 2-medium, 3-high)	erge) 3		and the c	onfidence leve	î af
A. Select the fac the informatio 1. Waste 2. Confi 3. Hazar Factor S	n. quantity (1=s dence level (1 d rating (1=lo ubscore A (fro nce factor	mall, 2-medium, 3-la -confirmed, 2-suspec w, 2-medium, 3-high)	erge) 3 ited) 1 2 ifactor score matrix)		and the c	onfidence leve	ì of
A. Select the fac the informatio 1. Waste 2. Confi 3. Hazar Factor S	n. quantity (1=s dence level (1 d rating (1=lo ubscore A (fro nce factor	mall, 2-medium, 3-la =confirmed, 2-suspec w, 2-medium, 3-high) im 20 to 100 based or	erge) 3 ited) 1 2 ifactor score matrix)		and the c	onfidence leve	î of
A. Select the fac the informatio 1. Waste 2. Confi 3. Hazar Factor S B. Apply persiste Factor Subscor	quantity (1=s dence level (1 d rating (1=lo ubscore A (fro nce factor e A x Persiste	mall, 2-medium, 3=la =corfirmed, 2=suspec m, 2=medium, 3=high) m 20 to 100 based or noce Factor = Subscor	erge) 3 ted) 1 2 n factor score matrix)		and the c	onfidence leve	î of
A. Select the facthe information 1. Waste 2. Confi 3. Hazar Factor S B. Apply persiste Factor Subscor C. Apply physical	quantity (1=s dence level (1 d rating (1=lo ubscore A (fro nce factor e A x Persiste 80 state multipl	mall, 2=medium, 3=la =corfirmed, 2=suspec w, 2=medium, 3=high) m 20 to 100 based or nce Factor = Subscor x 0.80	erge) 3 ted) 1 2 n factor score matrix)	84	and the c	onfidence leve	î of

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)		Fac to r Score	Maximum Possible Score
1. Surface Water Migration	2224			
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	ō	8	0	0
Surface permeability	Ō	6	Ō	18
Rainfall intensity	3	8	24	24
Subtotals	i		44	84
Subscore (100 x factor score subtota	ıl/maximum :	score subt	total)	52
2. Flooding	0	i	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotal	5		76	114
Subscore (100 x factor score subtoto	1/maximum	score sub	total)	67
Hisbort nathus, subseque				

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

IV. WAST	e mai	NAGENENT	PRACT	ICES
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A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 44
Waste Characteristics 64
Pathways 67
Total 175 divided by 3 =

58 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

58 x 1.00 = \ 58 \

HAZARD ASSESSMENT RATING METHODOLOGY FORY Name of Site: LANDFILL NO. 4 Location: OFF-BASE, WEST OF BUILDING 1143 Date of Operation or Occurance: 1956 - EARLY 1976'S Dwner/Operator: MAXWELL AFB Comments/Description: SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES. Site Rated by: R. M. REYNOLDS I. RECEPTORS Factor Multi- Factor Maximum Ratino plier Score Possible Rating Factor (Ø-3) Score A. Fopulation within 1,000 feet of site B. Distance to mearest water well 3 18 38 32 C. Land use/zoning within 1 mile radius 3 3 1 9 D. Distance to reservation boundry 3 13 6 18 E. Critical environments within 1 mile radius of site 1 18 18 F. Water quality of nearest surface water body 18 6. Ground water use of uppermost aquifer ø 27 G. H. Population served by surface water supply within 3 miles downstream of site I. Population served by ground-water supply 13 18 within 3 miles of site Subtotals 91 189 Receptors subscore (100 x factor score subtotal/maximum score subtotal) II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor score matrix) B. Apply persistence factor Factor Subscore A x Persistence Factor = Subscore B 9.80 C. Apply physical state multiplier Subscore B x Physical State Multiplier = Waste Characteristics Subscore 9.50 24 =======

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier		Maximum Possible Score
1. Surface Water Higration			-	
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	84
Subscore (100 x factor score subtotal	/maximum s	score subi	total)	79
2. Flooding	2	1	2	3
Subscore (100 x ?actor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	3	8	24	24
Direct access to ground water	3	8	24	24
Subtotals			100	114
Subscore (100 x factor score subtotal	/maximum s	score sub	total)	88

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 51
Waste Characteristics 24
Pathways 88
Total 163 divided by 3 =

54 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

54 x 1.00 = \ 54 \

Name of Site: C.E. DRUM STORAGE AREA					
ocation: FACILITY 1352 Date of Operation or Occurance: MID 197	Ø'S - PRESENT				
Owner/Operator: MAXWELL AFB Comments/Description: FORMERLY AN UNLI	NET ORFA (MIT TO : 61	F (975/5)			
·	NEW BREA TRIES IN ER				
Site Rated by: R. M. REYNGLDS					
I. RECEPTORS					
		Factor		Factor	
Rating Factor			piier		Possible Score
maring raceon					
A. Population within 1,800 feet of site		3	4	12	12
B. Distance to nearest water well		2	10	20	39
C. Land use/zoning within 1 mile radius D. Distance to reservation boundry		1 2	ن د	ن 17	ל <u>ים י</u>
o. Distance to reservation boundry E. Critical environments within 1 mile radi	us of site		16	18	9 18 30
F. Water quality of nearest surface water b		1	ó	5 6	18
6. Ground water use of uppermost aquifer	•	B	9	=	27
 Population served by surface water suppl 	Y	Ø	6	ø	18
within 3 miles downstream of site		3	6	18	18
 Population served by ground-water supply within 3 miles of site 		J	9	10	10
	Subtotals	•		81	189
Receptors subscore (100 x factor s			btotal)		
	core subtotal/maximu	s score su			45 ======
II. WASTE CHARACTERISTICS	core subtotal/maximu	e score su		·	45 ======
II. WASTE CHARACTERISTICS A. Select the factor score based on the est the information.	icore subtotal/maximu	e score su		·	45 ======
I. WASTE CHARACTERISTICS A. Select the factor score based on the est	imated quantity, the	degree of		·	45 ======
 MASTE CHARACTERISTICS Select the factor score based on the est the information. Naste quantity (1=small, 2=medi 	imated quantity, the um, 3=large) 2=suspected)	degree of		·	45 ======
II. WASTE CHARACTERISTICS A. Select the factor score based on the est the information. 1. Waste quantity (1=small, 2=medi 2. Confidence level (1=confirmed,	imated quantity, the um, 3=large) 2=suspected) 3=high)	degree of		·	45 ======
II. WASTE CHARACTERISTICS A. Select the factor score based on the est the information. 1. Waste quantity (1=small, 2=medi 2. Confidence level (1=confirmed, 3. Hazard rating (1=low, 2=medium,	imated quantity, the um, 3=large) 2=suspected) 3=high) based on factor score	degree of	hazard,	·	45 ======
II. WASTE CHARACTERISTICS A. Select the factor score based on the est the information. 1. Waste quantity (1=small, 2=medi 2. Confidence level (1=confirmed, 3. Hazard rating (1=low, 2=medium, Factor Subscore A (from 20 to 100 8. Apply persistence factor	imated quantity, the um, 3=large) 2=suspected) 3=high) based on factor scor	degree of	hazard,	·	45 ======
II. WASTE CHARACTERISTICS A. Select the factor score based on the est the information. 1. Waste quantity (1=small, 2=medi 2. Confidence level (1=confirmed, 3. Hazard rating (1=low, 2=medium, Factor Subscore A (from 20 to 100 B. Apply persistence factor Factor Subscore A x Persistence Factor =	imated quantity, the um, 3=large) 2=suspected) 3=high) based on factor score Subscore B 90 = 54	degree of	hazard,	·	45 ======

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

0

B. Rate the migration potential for 3 potential pathways; surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier		Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			58	84
Subscore (100 x factor score subtotal	/maximum s	score subf	total)	69
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	0
Direct access to ground water	2	8	16	24
Subtotals			60	90
Subscore (100 x factor score subtotal	/maximum :	score subf	total)	67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore	69
	=======================================

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 45
Waste Characteristics 54
Pathways 69
Total 168 divided by 3 =

168 divided by 3 = 56 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

56 x 0.95 = \ 53 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM Name of Site: LANDFILL NO. 5 Location: OFF-BASE, SOUTH OF LANDFILL NO. 4. Date of Operation or Occurance: EARLY 1970'S - 1974 Dwner/Operator: MAXWELL AFB Comments/Description: SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES. Site Rated by: R. M. REYNOLDS Factor Multi- Factor Maximum Rating plier Score Possible Rating Factor (6-3)Score A. Population within 1,000 feet of site 3 4 12 12 B. Distance to nearest water well 3 10 3.7 39 C. Land use/coming within 1 mile radius 1 3 9 D. Distance to reservation boundry 3 18 18 E. Critical environments within 1 mile radius of site 1 16 16 F. Water quality of nearest surface water body Ø 6 18 6. Ground water use of uppermost aquifer 27 H. Population served by surface water supply 18 within 3 miles downstream of site I. Population served by ground-water supply 18 18 within 3 miles of site Subtotals 91 189 Receptors subscore (100 x factor score subtotal/maximum score subtotal) 51 II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information. 1. Waste quantity (1=small, 2=medium, 3=large) Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor score matrix) 68 B. Apply persistence factor Factor Subscore A x Persistence Factor = Subscore B 6.86 = 48 C. Apply physical state multiplier Subscore B x Physical State Multiplier = Waste Characteristics Subscore 0.50 24

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier		Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	84
Subscore (100 x factor score subtotal	/maximum :	score subi	total)	79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	19
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtota)	/maximum	score sub	total)	81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. Waste management pi	KACTICES
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A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 51
Waste Characteristics 24
Pathways 81

Total 156 divided by 3 =

52 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

52	×	1.00	=	١	52	١

HAZARD ASSESSMENT RATING METHODOLOGY FORM LANDFILL NO. 6 Name of Site: OFF-BASE, SOUTH OF LANDFILL NO.5 Location: Date of Operation or Occurance: 1974 - PRESENT Owner/Operator: MAXWELL AFB Comments/Description: SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES. Site Rated by: R. M. REYNOLDS I. RECEPTORS Factor Multi- Factor Maximum Rating plier Score Possible (G-3) Rating Factor Score A. Population within 1,866 feet of site 3 12 12 1₽ 39 30 B. Distance to nearest water well ç C. Land use/zoning within 1 mile radius 1 3 D. Distance to reservation boundry 3 18 18 6 E. Critical environments within 1 mile radius of site 1 16 18 30 g F. Water quality of nearest surface water body 6 18 9 6. Ground water use of uppermost aquifer 27 . 18 H. Population served by surface water supply Ø 6 within 3 miles downstream of site I. Population served by ground-water supply 3 6 13 18 within 3 miles of site 91 Subtotals 189 Receptors subscore (100 x factor score subtotal/maximum score subtotal) 51 II. WASTE CHARACTERISTICS A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor score matrix) 69 B. Apply persistence factor Factor Subscore A x Persistence Factor = Subscore B 60 Ø.8€ 48 C. Apply physical state multiplier Subscore B x Physical State Multiplier = Waste Characteristics Subscore 8.58 48 24 =======

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

B. Rate the migration potential for 3 potential pathways; surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier		Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	84
Subscore (100 x factor score subtotal	/maximum :	score subt	total)	79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal	/maximum :	score subt	iotal)	81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81 -------

IV. WASTE HANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors Waste Characteristics

Pathways

Total

81 156 divided by 3 =

52 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score

> 52 1.00

51

24

H-16

Name of Site: LANDFILL NO. 2 Location: NEAR SOUTH END OF NW - SE RUNWAY				
Date of Operation or Occurance: EARLY 1948'S - 1951				
Owner/Operator: MAXWELL AFB				
Comments/Description: SANITARY LANDFILL WITH SOME INDUS	TRIAL WASTES.			
Site Rated by: R. M. REYNGLDS				
I. RECEFTORS				
II REDECTIONS	Factor	Multi-	Factor	Maximum
	Rating	plier	Score	Possible
Rating Factor	(6 -3)	·		Score
A. Fopulation within 1,888 feet of site	3	4		17
B. Distance to nearest water well	2	10	2%	33
C. Land use/zoning within 1 sile radius	2	3	6	Ġ
D. Distance to reservation boundry	3	- اه	18	ç 18
E. Critical environments within 1 mile radius of site	∉	12	E	3₽
F. Water quality of mearest surface water body	₽	6	Ø	13
6. Ground water use of uppermost aquifer	£	9	6	27
H. Population served by surface water supply	.9	6 9 6	ø	18
within 3 miles downstream of site				
 Population served by ground-water supply within 3 miles of site 	3	Ġ	13	18
Subtot	als		74	180
Receptors subscore (100 x factor score subtotal/max	iaua score sul	btotal)		41
·				
I. WASTE CHARACTERISTICS				
, ,,	the degree of	hazard, a	and the c	onfidence level of
the information.	•	hazard, i	and the c	onfidence level of
the information. 1. Waste quantity (1=small, 2=medium, 3=large)	2	hazard, i	and the c	onfidence level of
the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected)	2	hazard, i	and the c	onfidence level of
the information. 1. Waste quantity (1=small, 2=medium, 3=large)	2	hazard, i	and the c	onfidence level of
the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected)	2 1 2	hazard, d	and the c	onfidence level of
the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor s	2 1 2	·	and the c	onfidence level of
the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor s 6. Apply persistence factor	2 1 2	·	and the c	onfidence level of
the information. 1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 2% to 10% based on factor s 8. Apply persistence factor Factor Subscore A x Fersistence Factor = Subscore B 60 x 9.80 =	2 1 2 core matrix)	Ь₽	and the c	onfidence level of
1. Waste quantity (1=small, 2=medium, 3=large) 2. Confidence level (1=confirmed, 2=suspected) 3. Hazard rating (1=low, 2=medium, 3=high) Factor Subscore A (from 20 to 100 based on factor s B. Apply persistence factor Factor Subscore A x Fersistence Factor = Subscore B 60 x 9.80 = C. Apply physical state multiplier	2 1 2 core matrix)	Ь₽	and the c	onfidence level of

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier		Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals	5		66	84
Subscore (100 x factor score subtoto	ıl/maximum :	score sub	total)	79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	3	8	24	24
Direct access to ground water	3	8	24	24
Subtotals	5		100	114
Subscore (100 x factor score subtota	1/maximum s	score subf	total)	88

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88 ---

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors Waste Characteristics 24 Pathways 88

153 divided by 3 =

51 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score

Total

51 1.00 HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site:

LANDFILL NG. 3

Location:

BUILDING 1143

Date of Operation or Occurance:

1951 - 1956

Owner/Operator: MAXWELL AFB

Comments/Description:

SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES.

Site Rated by: R. M. REYNOLDS

Rating Factor	Factor Rating (9-3)	Multi- plier	Factor Score	Maximum Possible Score
. Population within 1,000 feet of site	2	4	В	12
Distance to nearest water well	3	10	38	30
. Land use/zoning within 1 mile radius	1	3	3	9
. Distance to reservation boundry	3	ó	13	18
Critical environments within 1 mile radius of site	1	19	19	3€
Water quality of nearest surface water body	3	ć	Ø	18
Ground water use of uppermost aquifer	9	9	₽	27
Population served by surface water supply within 3 miles downstream of site	9	6	8	18
Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			87	190
Receptors subscore (188 % factor score subtotal/maximum	m score su	btotal)		48

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large)	2
Confidence level (1=confirmed, 2=suspected)	1

3. Hazard rating (1=low, 2=medium, 3=high)

Factor Subscore A (from 20 to 100 based on factor score matrix) 69

B. Apply pe. sistence factor

Factor Subscore A x Persistence Factor = Subscore B

9.89 = 60 48

C. Apply physical state multiplier Subscore B x Physical State Multiplier = Waste Characteristics Subscore

> 48 9.59 24

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)			Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals	;		66	84
Subscore (100 x factor score subtota	l/maximum s	score subt	total)	79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals	;		92	114
Subscore (100 x factor score subtata	l/maximum :	score sub	total)	81
Winhert nothuny cuherapa.				

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

I۷.	WASTE	MANAGEMENT	PRACTICES
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A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 48
Waste Characteristics 24
Pathways 81

otal 153 divided by 3 = 51 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

51 x 1.00 = \ 51 \

Name of Site: HAR								
Location: NOR1				. r -				
Date of Operation or (51 - PRESE	Ni				
Cwher/Operator: MAXV			EA AND OTT	. no eteo a	STEPTION TOATS	ITNO ADEA	105 1 13	atain _ {din:
Comments/Description:	лнп	WEILL HR	TH HWD 311	i of fine f	TURESTION STATE	VING HREM	NO. 1 (1	740 6 - 1732·.
Site Rated by: R. !								
I. RECEPTORS								
						Multi-		
.							Score	Possible
Rating Factor					(£-3)			Score
A. Population within	1.069 fee	it of sit	e		2	4	8	12
B. Distance to meanest					2	18	20	30
C. Land use/zoning wit	thin 1 mi	le radiu	5		i	3	3	9
D. Distance to reserva					3	3 6	13	18
E. Critical environmen	nts withi	n 1 mile	radius of	site	1	1#	16	3₿
F. Water quality of ne					1	Ь	5	13
6. Ground water use of					Ø	9	ø	27
H. Population served b			supply		Ø	6	₽	18
within 3 miles down								
 Population served t within 3 miles of : 		-water s	пръју		2	6	18	18
				Subto	tals		83	190
Receptors sub	bscore (1	.00 x fac	tor score	subtotal/ma	ximum score sub	ototal)		46
II. WASTE CHARACTERIST	FICS							
A. Select the factor s the information.	score bas	ed on th	e estimate	d quantity,	the degree of	hazard, a	and the c	onfidence level of
the information.					the degree of	hazard, a	and the c	onfidence level of
	ntity (1=	small, 2	=medium, 3	=large)	3	hazard, a	and the c	onfidence level of
the information.	ntity (1= e level (small, 2	-medium, 3 med, 2=sus	=large) pected)	3	hazard, a	and the c	onfidence level of
1. Waste quan 2. Confidence 3. Hazard rat	ntity (1= e level (ting (1=1	small, 2 1=confir ow, 2=me	-medium, 3 med, 2-sus dium, 3-hi	=large) pected) gh)	3 1	hazard, a	and the c	onfidence level of
the information. 1. Waste quan 2. Confidence 3. Hazard rat	ntity (1= e level (ting (1=1 ore A (fr	small, 2: 1=confir ow, 2=me om 20 to	=medium, 3 med, 2≃sus dium, 3=hi 100 based	=large) pected) gh) on factor	3 1 1		and the c	onfidence level of
the information. 1. Waste quan 2. Confidence 3. Hazard rat Factor Subsco	ntity (1= e level (ting (1=1 ore A (fr	small, 2: 1=confir ow, 2=me om 20 to	=medium, 3 med, 2=sus dium, 3=hi 100 based tor = Subs	=large) pected) gh) on factor core B	3 1 1		and the c	onfidence level of
the information. 1. Waste quan 2. Confidence 3. Hazard rat Factor Subsco	ntity (1= e level (ting (1=1 ore A (fr factor x Persist	small, 2 1=confir ow, 2=me om 20 to ence Fac	=medium, 3 med, 2≃sus dium, 3=hi 100 based	=large) pected) gh) on factor core B	3 1 1 score matrix)		and the c	onfidence level of
the information. 1. Waste quan 2. Confidence 3. Hazard rat Factor Subsco	ntity (1= e level (ting (1=1 ore A (fr factor x Persist 50 te multip	small, 2: 1=confir ow, 2=me om 20 to ence Fac x	emedium, 3 med, 2=sus dium, 3=hi 100 based tor = Subs 0.80	=large) pected) gh) on factor core B =	3 1 1 score matrix)	58	and the c	onfidence level of
the information. 1. Waste quan 2. Confidence 3. Hazard rat Factor Subsco B. Apply persistence f Factor Subscore A x C. Apply physical stat	ntity (1= e level (ting (1=1 ore A (fr factor x Persist 50 te multip	small, 2: 1=confir ow, 2=me om 20 to ence Fac x	emedium, 3 med, 2=sus dium, 3=hi 100 based tor = Subs 0.80	=large) pected) gh) on factor core B =	3 1 1 score matrix)	58	and the c	onfidence level of

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

0

B. Rate the migration potential for 3 potential pathways; surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier		Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			60	108
Subscore (100 x factor score subtota	l/maximum :	score subi	total)	56
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			76	114
Subscore (100 x factor score subtota	l/maximum :	score sub	total)	67

C. Highest pathway subscore.

Enter the highest subscare value from A, B-1, B-2 or B-3 above.

Pathways Subscore	67	
	222222222	
	,	

44 Gross total score

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 46
Waste Characteristics 20
Pathways 67
Total 133 divided by 3 =

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

44 x 1.00 = \ 44 \

APPENDIX I

REFERENCES

APPENDIX I

REFERENCES

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APPENDIX J

GLOSSARY OF TERMINOLOGY
AND ABBREVIATIONS

APPENDIX J GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ABS: Air Base Squadron.

ABW: Air Base Wing.

ACFT MAINT: Aircraft Maintenance.

AF: Air Force.

AFB: Air Force Base.

AFCS: Air Force Communications Service.

AFESC: Air Force Engineering and Services Center.

AFFF: Aqueous Film Forming Foam, a fire extinquishing agent.

AFR: Air Force Regulation.

AFRES: Air Force Reserve.

AFS: Air Force Station.

AFSC: Air Force Systems Command.

Ag: Chemical symbol for silver.

AGE: Aerospace Ground Equipment.

Al: Chemical symbol for aluminum.

ALLUVIUM: Materials eroded, transported and deposited by streams.

ALLUVIAL FAN: A fan-shaped deposit formed by a stream either where it issues from a narrow mountain valley into a plain or broad valley, or where a tributary stream joins a main stream.

ANG: Air National Guard.

APS: Aerial Port Squadron.

ARTESIAN: Ground water contained under hydrostatic pressure.

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield to a well or spring.

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

AQUITARD: A geologic unit which impedes ground-water flow.

ASC: Audiovisual Service Center.

ATC: Air Training Command.

AU: Air University

AVGAS: Aviation Gasoline.

Ba: Chemical symbol for barium.

BES: Bioenvironmental Engineering Services.

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals.

CALLA 301: A high phosphate cleaning compound.

CAMS: Consolidated Aircraft Maintenance Squadron.

Cd: Chemical symbol for cadmium.

CE: Civil Engineering.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act.

CES: Civil Engineering Squadron.

CIRCA: About; used to indicate an approximate date.

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation.

CMS: Component Maintenance Squadron.

CN: Chemical symbol for cyanide.

COASTAL PLAINS: Physiographic province of the Eastern United States characterized by a gently seaward sloping surface formed over exposed, unconsolidated, stratified marine fluvial sediments. Typical coastal plain features include low hills and ridges, organic deposits, flood-plains and high water tables.

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.

COE: Corps of Engineers.

COMD: Command.

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself.

CONFINING UNIT: An aquitard or other poorly permeable layer which restricts the movement of ground water.

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water.

CPM: Counts per minute (alpha radiation measurement).

Cr: Chemical symbol for chromium.

CRS: Component Repair Squadron.

CSG: Combat Support Group.

Cu: Chemical symbol for copper.

DET: Detachment.

DIP: The angle at which a stratum is inclined from the horizontal.

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure.

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water.

DOD: Department of Defense.

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows.

DPDO: Defense Property Disposal Office, previously included Redistribution and Marketing (R&M) and Salvage.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers.

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment.

EMS: Equipment Maintenance Squadron.

ENT: Ear, Nose and Throat, an area of medical specialization.

EOD: Explosive Ordnance Disposal.

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation.

EPA: U.S. Environmental Protection Agency.

EPHEMERAL AQUIFER: A water-bearing zone typically located near the surface which normally contains water seasonally.

EROSION: The wearing away of land surface by wind, water, or chemical processes.

FAA: Federal Aviation Administration.

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes.

FAULT: A fracture in rock along which the adjacent rock surfaces are differentially displaced.

Fe: Chemical symbol for iron.

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year.

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient.

FMS: Field Maintenance Squadron.

FPTA: Fire Protection Training Area.

GATR: Ground to Air Transmitter Receiver Site.

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds.

GLACIAL TILL: Unsorted and unstratified drift consisting of clay, sand, gravel and boulders which is deposited by or underneath a glacier.

GLAUCOMITIC SAND AND GRAVEL: A mixture of sand, gravel and glaucomite, an iron-potassium silicate mineral which imparts a green color to the mixture. Glaucomite is geologically significant because it indicates slow sedimentation.

GLIDE-BLOCK: A large section of a geologic unit that has separated from the main portion of the unit due to earthquake/landslide-induced lateral movement.

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure.

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water.

HALF-LIFE: The time required for half the atoms present in radioactive substance to disintegrate.

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material and landscape debris.

HARM: Hazard Assessment Rating Methodology.

HAZARDOUS WASTE: A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

HAZARDOUS WASTE GENERATION: The act or proce $\mathfrak z$ of producing a hazardous waste.

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations.

Hg: Chemical symbol for mercury.

HQ: Headquarters.

HWMF: Hazardous Waste Management Facility.

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of

extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standards.

INFILTRATION: The movement of water through the soil surface into the ground.

IRP: Installation Restoration Program.

ISOPACH: Graphic presentation of geologic data, including lines of equal unit thickness that may be based on confirmed (drill hole) data or indirect geophysical measurement.

JP-4: Jet Propulsion Fuel Number Four.

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water.

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water.

LENTICULAR: A bed or rock stratum or body that is lens-shaped.

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate.

LOESS: An essentially unconsolidated unstratified calcareous silt; commonly homogeneous, permeable and buff to gray in color.

LOX: Liquid Oxygen.

LYSIMETER: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone.

MAC: Military Airlift Command.

MAINT: Recording System Maintenance.

MATS: Military Air Transport Service.

MAW: Military Airlift Wing.

MEK: Methyl Ethyl Ketone.

MGD: Million Gallons per Day.

MOA: Military Operating Area.

MOGAS: Motor gasoline.

Mn: Chemical symbol for manganese.

MODIFIED MERCALLI INTENSITY: A number describing the effects of an earthquake on man, structures and the earth's surface. A Modified Mercalli Intensity of I is not felt. An intensity of VI is felt indoors and outdoors and for an intensity of VII it becomes difficult for a man to remain standing. Intensities of Ix to XII involve increasing levels of destruction with destruction being nearly total at an intensity of XII.

MONITORING WELL: A well used to measure ground-water levels and to obtain samples.

MORAINE: An accumulation of glacial drift deposited cheifly by direct glacial action and possessing initial constructional form independent of the floor beneath it.

Mr/hr: Millirem/hour; a measure of radioactivity.

MSL: Mean Sea Level.

MUNITION ITEMS: Munitions or portions of munitions having an explosive potential.

MUNITIONS RESIDUE: Non-explosive segments of waste munitions (i.e., bomb casings).

MWR: Morale Welfare and Recreation.

NCO: Non-commissioned Officer.

NCOIC: Non-commissioned Officer In-Charge.

NDI: Non-destructive Inspection.

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation.

NGVD: National Geodetic Vertical Datum of 1929.

Ni: Chemical symbol for nickel.

NON-CALCAREOUS: Not bearing calcium carbonate $(CaCO_3)$ a characteristic mineral of marine paleoenvironment.

NPDES: National Pollutant Discharge Elimination System.

OEHL: Occupational and Environmental Health Laboratory.

OIC: Officer-In-Charge.

OMS: Organizational Maintenance Squadron.

OPNS: Operations.

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon.

OSI: Office of Special Investigations.

O&G: Symbols for oil and grease.

Pb: Chemical symbol for lead.

PCB: Polychlorinated Biphenyl; liquids used as a dielectrics in electrical equipment.

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.

PD-680 (PS-661): Cleaning solvent.

pH: Negative logarithm of hydrogen ion concentration.

PIEDMONT: An upland subdivision of the Appalachian Highlands Physiographic Province, extending from Alabama to New York. The zone is characterized by rolling hills and residual ridges formed by dissection of peneplained irgneous and metamorphic terrain.

PL: Public Law.

PMEL: Precision Measurement Equipment Lab.

POL: Petroleum, Oils and Lubricants.

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose.

POTENTIALLY ACTIVE FAULT: A fault along which movement has occurred within the last 25-million years.

POTENTIOMETRIC SURFACE: The imaginery surface to which water in an artesian aquifer would rise in tightly screened wells penetrating it.

PPB: Parts per billion by weight.

PPM: Parts per million by weight.

PRECIPITATION: Rainfall.

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years.

QUICKTRANS: Automated Terminal Service.

RCRA: Resource Conservation and Recovery Act.

RD: Low-level radioactive waste disposal site.

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade.

RECHARGE: The addition of water to the ground-water system by natural or artificial processes.

RECON: Reconnaissance.

RIPARIAN: Living or located on a riverbank.

RWDS: Radioactive Waste Disposal Site.

SAC: Strategic Air Command.

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards.

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water.

SCS: U.S. Department of Agriculture Soil Conservation Service.

SEISMICITY: Pertaining to earthquakes or earth vibrations.

SLUDGE: Any garbage, refuse, or slude from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not

include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923).

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water.

SS: Supply Squadron.

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste.

STP: Sewage Treatment Plant.

TAC: Tactical Air Command.

TACC: Tactical Air Control Center.

TASS: Tactical Air Support Squadron.

TCA: 1,1,2,2-Tetrachloroethane.

TCE: Trichloroethylene.

TDS: Total Dissolved Solid, a water quality parameter.

TFW: Tactical Fighter Wing.

TIDAL STRIP: Physiographic subdivision commonly associated with (ocean) wave activity. Usually includes berms, beach ridges, tidal flats and related landforms typically produced by coastal erosional and depositional processes.

TOC: Total Organic Carbon.

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism.

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient.

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous.

TS: Transportation Squadron.

TSD: Treatment, storage or disposal.

TTW: Technical Training Wing.

UNCONFORMABLE: Not succeeding the underlying geologic strata in proper chronological sequence; a bed or stratum having the relation of unconformity to the underlying materials.

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground-water.

USAF: United States Air Force.

USAFSS: United States Air Force Security Service.

USFWS: United States Fish and Wildlife Service.

USGS: United States Geological Survey.

USMC: United States Marine Corps.

USN: United States Navy.

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

WWTP: Wastewater Treatment Plant.

Zn: Chemical symbol for zinc.

APPENDIX K INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES FOR MAXWELL AFB

APPENDIX K INDEX OF REFFRENCES TO POTFNTIAL CONTAMINATION SOURCES FOR MAXWELL AFB

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